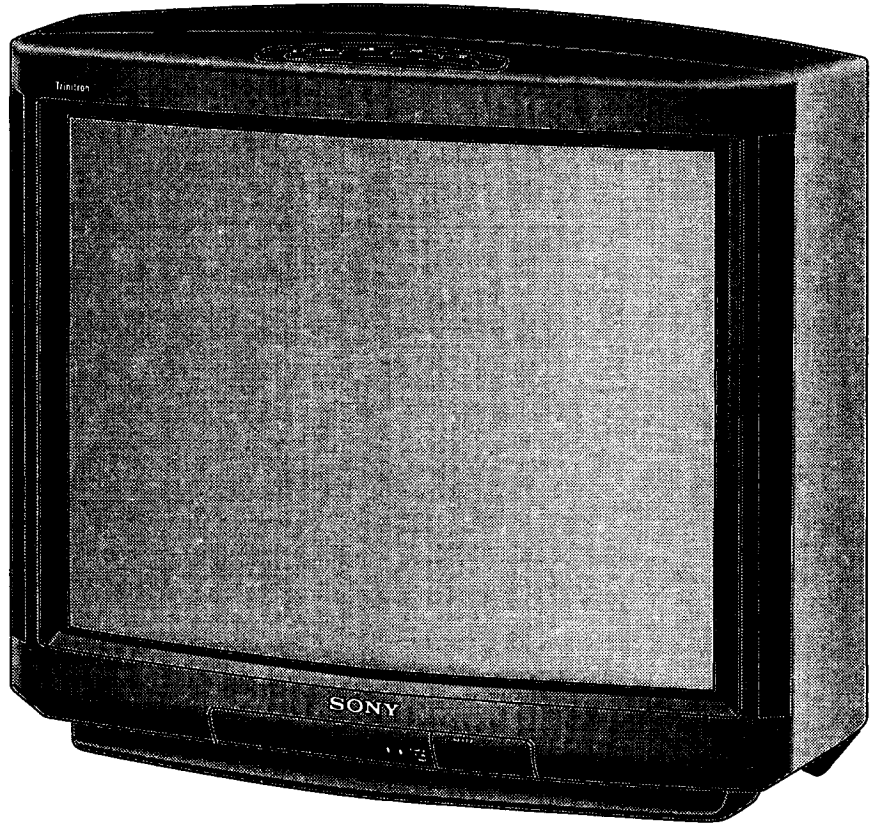
SONY ®

Training Manual



Color Television

AA-2/BA-3 Chassis

Circuit Description & Troubleshooting

Course:CTV-24

Color TV Circuit Description &Troubleshooting

Chassis:AA-2 Chassis
BA-3 Chassis

Prepared by
National Training Department
Sony Service Company
A Division of Sony Electronics, Inc.

Course presented by _____

Date _____

Student Name _____

Sony AA-2 Direct View TV Chassis Features

MODEL	Inception	Audio/Video Inputs	Audio/Video Outputs	1 tuner PIP	2 tuner PIP	Rm light Sensor Clock, S link	Tilt Correction	Surround Sound	SRS Sound Retrieval
KV27S20	Feb-96	1	audio only					x	
KV27S22	97	1	audio only					x	
KV27S25	Feb-96	2	audio only	x				x	
KV27S26	97		audio only	x				x	
KV27S35	Sep-96	2	audio only		x			x	
KV27S36	97		audio only		x			x	
KV27V20	Jul-96	2	1					x	x
KV27V22	97	2	audio only			x		x	x
KV27V25	Jul-96	3	1	x		x		x	x
KV27V26	97	3	1	x		x		x	x
KV27V35	Jul-96	3	1		x	x		x	x
KV27V36	97	3	1		x	x		x	x
KV32S20	Mar-96	1	audio only					x	
KV32S22	97	1	audio only					x	
KV32S25	Mar-96	2	audio only	x				x	
KV32S26	97		audio only	x				x	
KV32S35	Sep-96	2	audio only		x			x	
KV32S36	97		audio only		x			x	
KV32V25	Jul-96	3	1	x		x		x	x
KV32V26	97	2	1	x		x		x	x
KV32V35	Jul-96	3	1		x	x		x	x
KV32V36	97	3	1		x	x		x	x
KV35S26	97		audio only	x			?	x	
KV35S36	97		audio only		x		?	x	
KV35V35	May-96	3	1		x	x	x	x	x
KV35V36	97	3	1		x	x	?	x	x
KV35V75	May-96	3	1		x	x	x	x	x
KV35V76	97	3	1		x	x	?	x	x

INTRODUCTION

Purpose
This book is made for the experienced service technician to help him/her understand how the circuitry for Sony's new AA-2 and 20" screen BA-3 direct view TV chassis works, from a servicing standpoint.

Layout
This book is laid out with simplified diagrams and circuitry description in the order of the TV set's operation. The operational order chosen is from TV plug in to a picture appearing on the screen.

The simplified diagrams of the video and audio processing show signal flow with muting locations. These mute stages are more common place in this TV because most of this TV's stages are always powered (as long as the set is plugged in to AC). Therefore at power OFF, when only the Jungle IC powers down, the remaining stages are still active, which would amplify popping sounds (noise) if it were not for the muting circuits. The muting circuits are controlled by the Syscon/Micon IC that is always powered even after the set is turned OFF.

Text
For each simplified diagram, a simplified overview is provided to take you rapidly through each stage. After the overview, a detailed circuit description is provided with in-depth information. Following this are troubleshooting hints, which contains strategies, symptoms, and/or voltages in a defective and the normal state. This aids you in determining if the voltage you have is closer to the normal or defective voltage.

New Circuits
In the AA-2 chassis, Sony has taken a departure from previous chassis designs of these stages, which will affect your troubleshooting:

1. Power distribution,
2. Protection,
3. Blanking, and
4. Video distribution.

Tilt Correction Feature
The circuitry for this feature is not shown in this book. It is found only in the 35" TVs and it has only a few discrete devices. It is software controlled by the main System Control Microprocessor (Micon). At power ON, Micon outputs serial data that is fed into a digital to analog converter IC that outputs a DC voltage to the velocity modulation circuit board at the CRT neck. The output of the buffer on this board is a DC voltage to a coil wrapped around the neck of the CRT.

Picture tilt (rotation) is achieved by applying DC current to this CRT neck coil. As the 3 electron beams from the cathode pass through the magnetic field created by the coil, they are twisted/rotated thus rotating the picture. The greater the coil current, the more the rotation.

Room Light Sensor / Lumisponder Feature
This circuit has a photocell IC at the front panel board that monitors the ambient room light and adjusts the picture level accordingly. For example, if the viewer shuts off the room light, the TV will reduce picture level (contrast and color) accordingly so the picture does not appear excessively bright.

S-Link Feature
When connected to a VCR that also has this feature, via a 3.5mm mini plug cable, it allows the viewer to press just the play button on the VCR to view the tape. The VCR outputs serial data to turn ON the TV and change to the designated video input to view this VCR.

Matrix Surround Sound Feature
Turned ON/OFF from the menu, this takes the normal audio and simulates the sound quality of a concert Hall or Movie theater using the TV's built in speakers.

SRS = Sound Retrieval System Feature
Operates in both stereo and mono to widen the soundstage, recover subtleties present in the original performance. Uses the built in TV speakers to recreate the realism of live sound by equalizing and positioning sounds in three dimensional space.

BLOCK DIAGRAM

Overview

The AA-2 direct view TV chassis differs from the previous Sony TV sets in the start-up operation and in the Picture-in-Picture signal flow. This TV set starts by switching on only the 9V power supply, since all of the other power supply voltages are always active, as long as the set is plugged in. This TV starts up when System Controls/Micon tells the +9Vdc supply to switch ON permitting the Jungle IC to start the horizontal oscillator and develop high voltage. This completes the start-up of the TV.

The Picture-in-Picture circuitry differs in that the main video signal flow does not pass through the Picture-in-Picture circuitry. The Picture-in-Picture video signal source comes from the AV switch directly and the child picture replaces the main picture at the Jungle IC when called for. In addition to the start-up and PIP sections being different, the blanking stages are slightly different from previous Sony chassis.

AC In

When this TV set is plugged in, the oscillator power supply stage begins working immediately to output these voltages:

1) +135Vdc;
2) Audio voltage at +23Vdc (33Vdc unloaded);
3) Standby 5Vdc
4) +10Vdc which will become the 9V switched line and a 5Vdc line (unswitched) for the Micon IC.

Therefore, in this TV set, as soon as the set is plugged in, various voltages are available throughout the entire set.

Start up

When the TV set is turned on, either from the front panel power switch or from the remote control, Syscon/Micon IC001 outputs a HIGH on the relay line to the 9V regulator inside the power supply block. This 9V regulator switches ON and outputs regulated 9V to the Jungle IC. The Jungle IC in turn starts the crystal, horizontal and vertical oscillator stages.

The horizontal signal is applied to the flyback transformer to develop deflection for horizontal scanning and high voltage. The flyback manufactures high voltage for the picture tube (28kV on the 27" TVs), and the following ("scan derived") voltages necessary for TV operation:

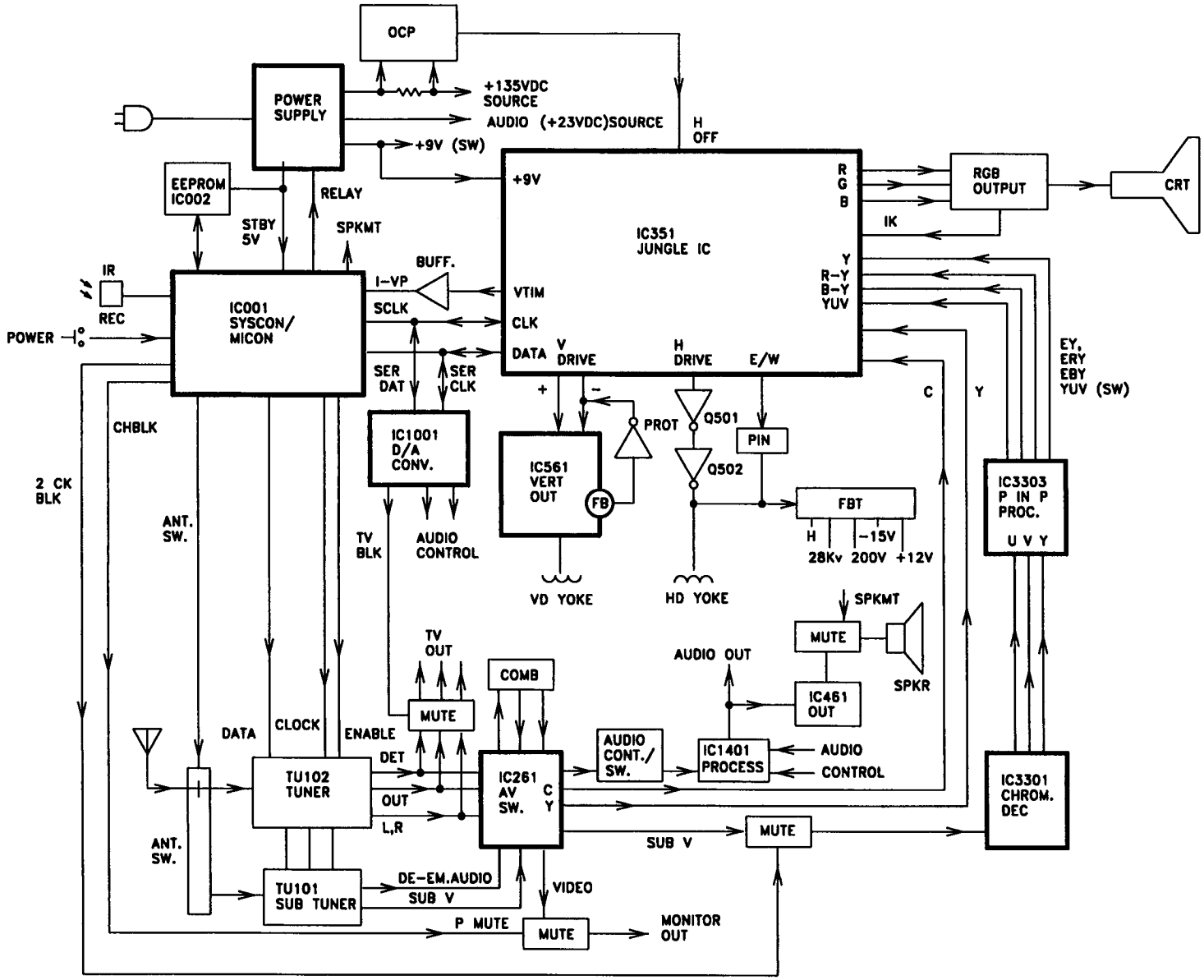
1) +12V is used for the vertical output stage and pincushion stages;
2) -15V is also used for these same two sections;
3) +200V is used for the G2 screen grid of the picture tube;
4) +5,500Vdc Focus voltage at the G4 picture tube.

The vertical oscillator signal is used for both vertical deflection and for system control's serial data timing (VTIM). System controls needs these vertical timing pulses in order to output serial data during the vertical interval and not during the picture time so there is no interference.

Blanking

Once the Jungle IC receives 9V, the next step after the starting of the horizontal oscillator is to unblank the picture and permit the video to output the IC to the picture tube's cathodes. In order to do this, three main conditions must be met:

1) the vertical deflection must be proven operational;
2) the serial data and clock must be input
3) the IK signal from the picture tube must also be input when white balance is completed.



AA-2 CHASSIS BLOCK DIAGRAM

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Main Video Path

The main video takes the following path between the main TU102 tuner and the picture tube:

- Tuner TU-102 outputs 1.5V p-p of video to A/V switch IC261.
- IC261 outputs 2V p-p video to the Comb filter. The comb filter then returns 2V p-p of luminance (Y) and chroma (C) to IC261.
- A/V switch IC261 selects luminance and chroma from either the tuner or external video ("S") input and outputs them to the Jungle IC351.
- The Jungle IC outputs 2Vpp RGB signals to the RGB output stage which then amplifies the RGB signals to 180Vpp level and applies them to the three cathodes of the picture tube.

PIP Path

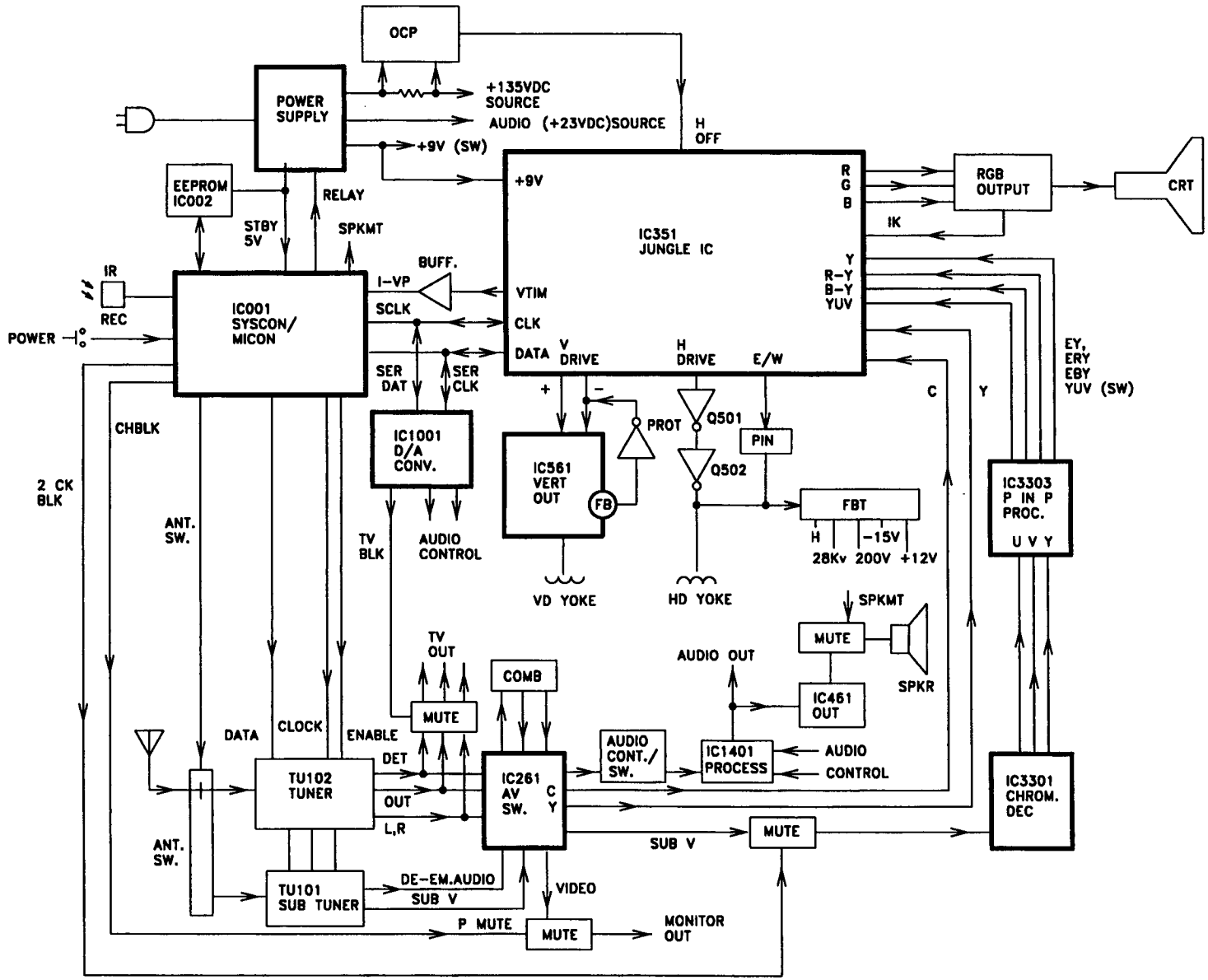
This signal begins at the sub tuner, TU-101, and gets mixed in with the main picture at the Jungle IC351 before outputting to the picture tube. The signal chain is as follows:

1. Sub tuner PU-101 outputs 2V p-p of video from the sub V line to A/V switch IC261.
2. A/V switch IC261 outputs 2V p-p at the sub V line (child picture) through a mute transistor. The mute transistor is activated momentarily at channel change. 2Vp-p goes to the Chroma Decoder IC3301.
3. Chroma decoder IC3301 outputs R-Y, B-Y and Y at 1.5V p-p with the color bar signal input to the PIP processor IC3303.
4. PIP processor IC3303 has Input = 1.5V p-p, output = 0.7V p-p. Output is to Jungle IC351.
5. Jungle IC351 has various inputs besides the main one. The child picture input is 0.7V p-p only when the PIP is switched ON from the remote control. PIP IC3303 also outputs a YUV signal to the Jungle IC351. It is used by IC351 to select either the main picture or the small child picture. When this YUV line goes HIGH, the main picture is switched out of the signal path and the small PIP child picture is switched in. The output of Jungle IC351 is the RGB signal applied to the output transistors on the CRT board.
6. RGB output transistor stage. The RGB signal that is input is amplified and applied to the cathodes of the picture tube for display.

Audio

The audio path starts at the tuner and ends at the speaker. It takes the following path:

1. Main tuner TU102 outputs the left and right signal to A/V switch IC261, paralleling the video path.
2. A/V switch IC261 outputs left and right channels to discrete Audio Control matrix stage.
3. The discrete Audio Control matrix stage makes the surround and SRS matrix signal. The selection is chosen by a switch which is not shown and output to the tone control processor IC1401.
4. Processor IC1401 changes the volume, bass, and treble based on the customer's requirements. Control comes from the microprocessor IC001 via the serial data line. The audio output goes to both the TV's rear panel audio output terminal and the Output IC461.
5. Output IC461 generates the current necessary to drive the speakers. Its output can be muted by customer request from the menu. System controls will output a HIGH at the SPK MT line which inputs the audio output IC and stops the speaker sound. This permits the sound from the variable output terminal to still feed TV sound to the hi-fi stereo system that it is connected to. It also can be switched to fixed output with the speaker muted.



AA-2 CHASSIS BLOCK DIAGRAM

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POWER SUPPLY / POWER ON

Overview

Unlike previous Sony direct view TV sets, when this TV is plugged in to AC, almost all the DC voltages are output from the DC to DC converter type power supply. The only one that is switched ON at turn ON is the +9V line. Therefore, as long as the set is plugged in, all supply voltages output this power supply, except for the +9V output to the Jungle IC.

WARNING - Before plugging in the power supply board, discharge the 2 large main capacitors, C606 & C607 or the 5 lead 9V regulator IC641 will be destroyed. These parts are all located on the power supply board.

Standby Power

120V AC is applied to Bridge Rectifier D602 through common mode rejection transformer T601 and T602 at plug in. R623 is a current limiting surge resistor to prevent blowing a fuse at plug in when main caps C606 and C607 would represent a momentary short before they charged. R603 is used to provide a ground path between the chassis ground and the AC line in case of a lightning strike at the antenna/cable lines or at the video input. The bridge rectifier D602 outputs 340Vdc to the oscillator circuit consisting of Q601 and Q602. Capacitors C607 and C606 are the voltage doubler and filter capacitors for this DC voltage. Resistors R606 and R605 divide the voltage equally across the two capacitors. Fusible resistor R607 is designed to open if there is a short or heavy current demand in the Q601, Q602 oscillator circuit/load.

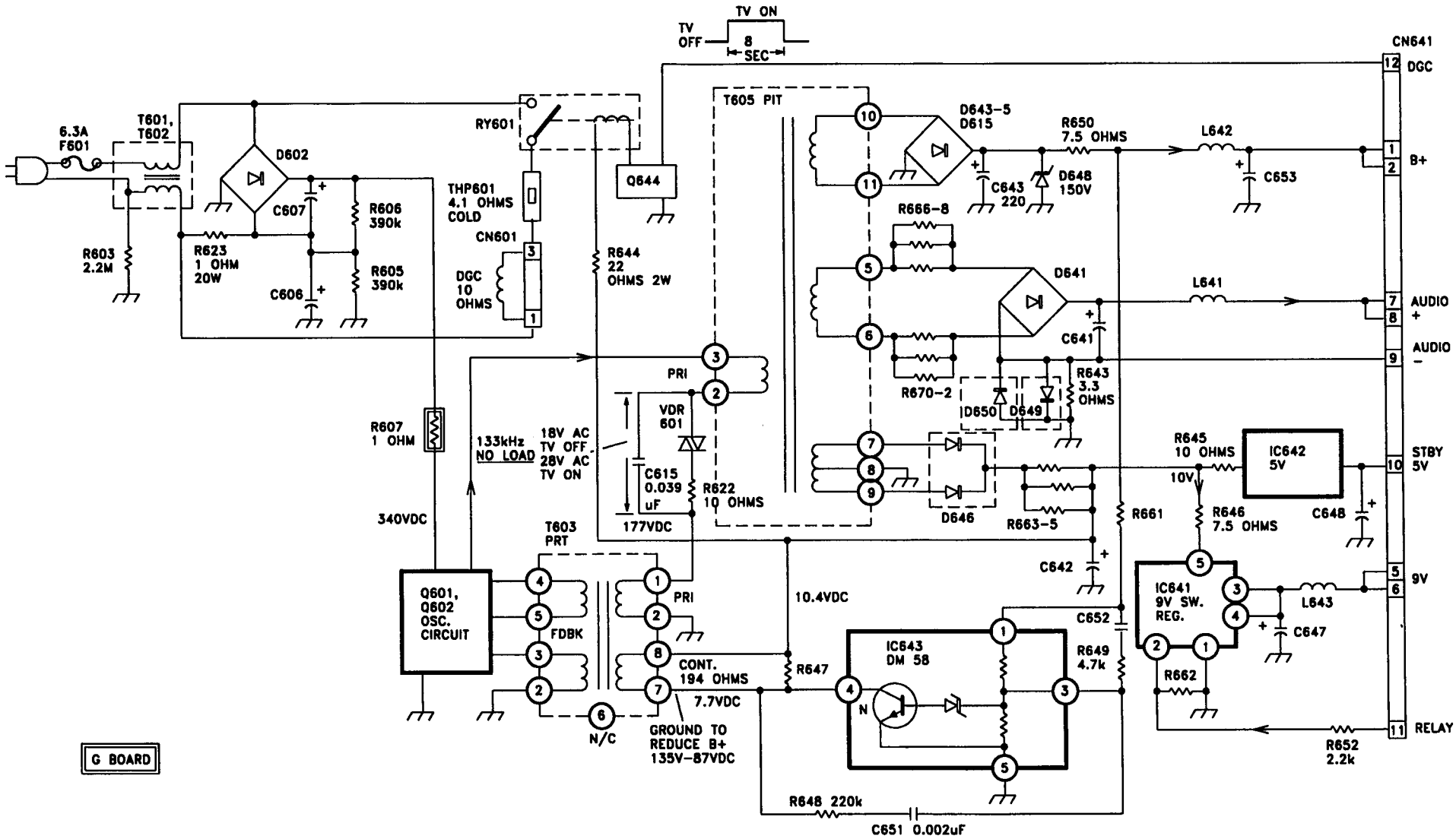
Once Q601 and Q602 receive voltage, the circuit oscillates with the aid of feedback transformer T603. The output of the oscillator circuit is a square wave, applied to the primary of transformer T605/pin 3. It's path continues from T605/pin 2 through the capacitor C615 and through the primary of the feedback transformer T603/pin1 to hot ground at T603/pin 2. The VDR601 prevents a heavy current demand from exceeding the voltage rating of C615, which could occur during a short in the load. The feedback transformer T603 has two secondary feedback windings at pins 4 & 5, and 2 & 3. These are used to sustain the oscillation of Q601 and Q602.

Main transformer T605 has three secondary windings. The first secondary outputs 135V B+ from T605/pin 10 and 11 after the D643-45 bridge rectifiers. The B+ voltage is passed through fusible resistor R650 and L642 to output CN641/pin 1 and 2. Be aware of the 150V zener diode on this B+ path. It is designed to short-circuit if the voltage climbs above 150V. The instant short-circuit will in turn prevent damage in the TV set, and shortly open fusible resistor R607, that feeds B+ to the oscillator circuit, shutting OFF the TV.

Another T605 secondary feeds 23Vdc to the audio stages (33Vdc unloaded). This AC voltage (from T605,pins 5 and 6) is applied through fusible resistors R666-R668 and R670-R672 and applied to bridge rectifier, D641. The 23V output is filtered by the L641 choke and capacitor C641 before outputting 23V to connector CN641/pin 7 & 8. Resistor R643 and clamping diodes D650 and D649 are designed to raise the ground of the audio line above chassis ground to prevent ground noise from being picked up by the audio section.

T605 winding at pins 7,8 and 9 provides standby 5V to the Micon/Syscon microprocessor IC001, and 9V to the Jungle IC. The AC voltage that outputs T605/pins 7 & 9 is full wave rectified by D646, fused by resistors R663 to R665, and filtered by capacitor C642. This 10Vdc is split into two paths. First it is applied to 5V regulator IC642 to output regulated standby 5V from connector CN641/pin 10. This 10V is also applied to the 9V switching regulator IC641, as well as the B+ regulating control circuitry of the power supply.

The 9V switching regulator IC641 will only output 9V with an input HIGH at pin 2. This HIGH input comes from Micon / Syscon IC001 when powered ON.



POWER SUPPLY/POWER ON

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SONY AA-2 TV Chassis Power Supply Output Voltages - load unplugged							
Primary (gnd = C606 neg end)			Secondary (gnd = E at output socket CN641/pin 3,4)				
Variac controlled AC input Voltage	AC Current (no load)	Oscillator Frequency	135Vdc B+ Voltage	9V output (switched)	Audio * no load	Stby 5V	135V B+ output with soft start Q645 shorted
20Vac	160ma AC	57 kHz	67Vdc	0Vdc	30Vdc	3.45Vdc	31Vdc
30Vac	323ma AC	53 kHz	110Vdc	0Vdc	30Vdc	5Vdc	37Vdc
36Vac	342ma AC	53 kHz	135Vdc	0Vdc	33Vdc	5Vdc	39Vdc
40Vdc	287ma AC	55 kHz	135Vdc	0Vdc	33Vdc	5Vdc	39Vdc
50Vac	188ma AC	61 kHz	135Vdc	0Vdc	33Vdc	5Vdc	54Vdc
120Vac	76ma AC	133 kHz	135Vdc	0Vdc	33Vdc	5Vdc	113Vdc

* 23 Vdc with power supply (loaded) connected and set running - no sound output.

Regulation

Regulation is achieved by monitoring the 135V B+ line and using it to control the frequency of the oscillator circuit. By changing the frequency of the oscillator circuit, the voltage at the secondary of the main power transformer T605 will change correspondingly, either decreasing or increasing to bring the voltage back to 135Vdc. The heart of the regulation circuit consists of IC643 and feedback transformer T603. The 135V B+ that is output from the secondary is sampled at IC643/ pin 1. This is applied internally to a voltage divider which drops the voltage down to 2.5V and applies it to the circuitry within, to control the current flowing from pin 4 to ground. The regulation loop works this way: If the 135Vdc B+ rises, the 2.5V at pin 3 proportionally begins to rise, turning on the transistor within IC643 a little bit harder. This increases the current through the feedback transformer T603's control winding at pin 8 through pin 7 and through IC603/pin 4 to ground. As more current flows through this control, or cross field winding, the effective inductance of this transformer decreases, causing the oscillator connected to it to increase in frequency. The increase in oscillator frequency moves further beyond the primary transformer T605's resonate frequency, causing its efficiency to decrease, thus lowering the secondary voltage, bringing the 135V B+ line back to 135V.

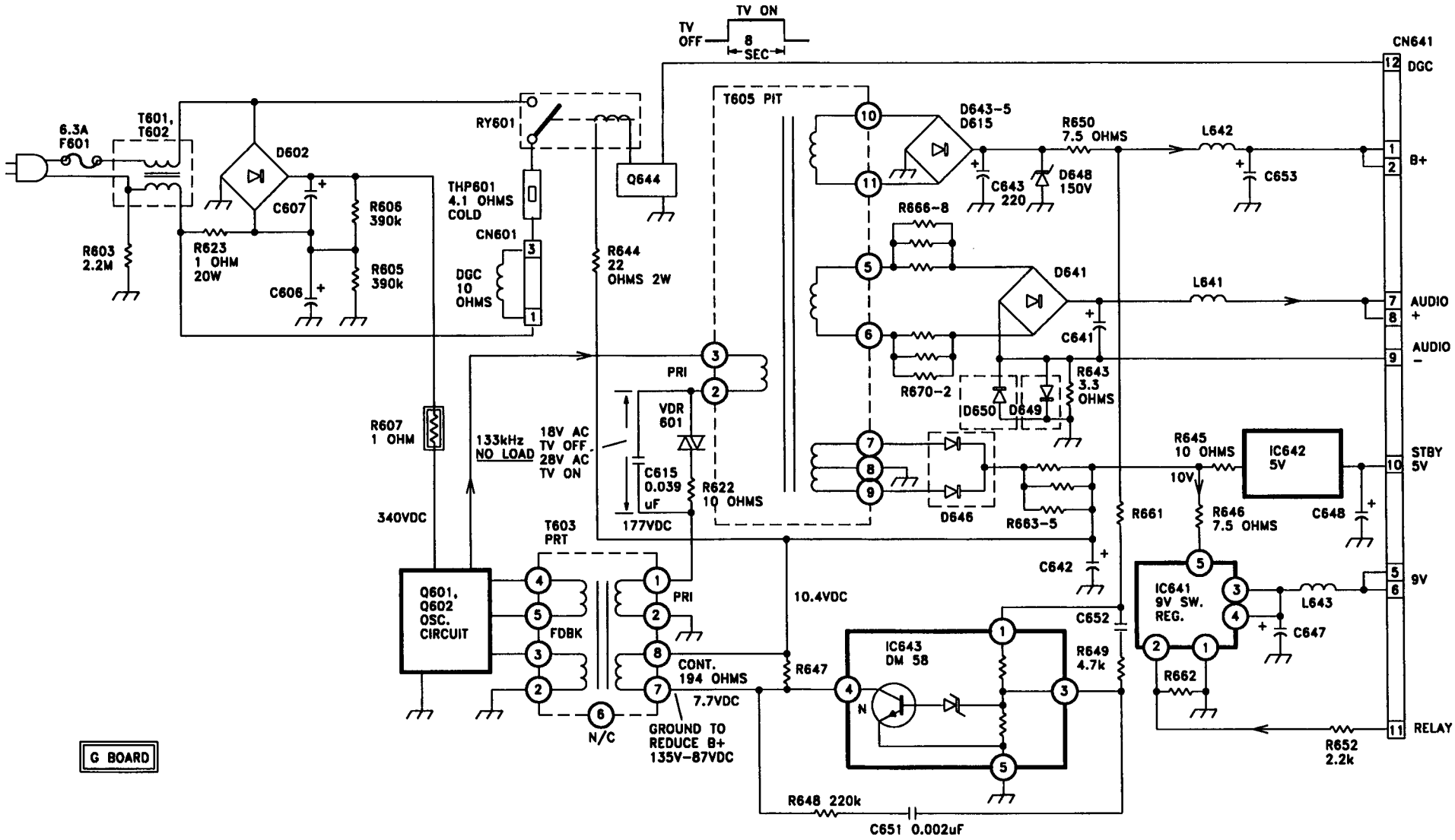
In the event of shutdown, to reduce the B+ voltage by defeating parts of this regulating stage, ground pin 7 of feedback transformer T603. This will reduce the 135V B+ in a working TV set down to 87Vdc. This ground bypasses the regulator IC643, as well as the printed circuit foil patterns that feed the 135Vdc to it. When the 135V line drops to a reasonable level and shutdown no longer occurs, then it is safe to conclude that the IC is not getting the proper voltages or the IC itself is defective so it can not regulate.

Power ON

When the set is powered ON, either from the remote or from the front panel push button, the microprocessor IC001 (not shown) outputs a HIGH which is applied to relay input CN641/pin 11 to the 9V switched regulator IC641/pin 2. This HIGH turns on the regulator and permits it to output regulated 9V at pins 3 & 4. This switched +9Vdc is filtered by capacitor C647 and inductor L643 before it outputs from CN641/pins 5 & 6 to the Jungle IC. Once the Jungle IC receives this 9V, it will power up the horizontal oscillator and high voltage sections to begin the TV set operation, since all the other voltages are already powered.

Degaussing

The degaussing circuitry is turned ON whenever the set is powered ON. The circuitry utilized is: the degaussing coil, a thermistor, and a relay, which is connected into the microprocessor IC001 (not shown).



POWER SUPPLY/POWER ON

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When the set is turned ON, the microprocessor IC001 outputs a HIGH, not only to the 9V switching IC641/pin2, but also to the degaussing coil relay through a separate port. This HIGH from that separate port enters the power supply connector CN641/pin 12 and gets applied to relay driver transistor Q644, turning it ON, which in turn energizes the relay. Once the relay contacts close, power is applied through the degaussing coil and the 4 ohm (cold) thermistor. It takes just about four seconds for the thermistor to heat up and decrease the amount of current to the degaussing coil. The degaussing is effectively finished at this time.

However, the relay does not disengage until after the microprocessor receives a final completion command from the Jungle IC telling it everything is OK. This final communication coincides with the ending of the blinking front panel timer light that begins to blink when the Jungle IC sends out a busy signal. Therefore in normal operation, eight seconds after the set is powered ON, the picture tube has warmed up, the Jungle IC sends out an OK (not busy) signal, the timer light stops blinking, and the degaussing coil relay disengages.

Troubleshooting - Dead Set

If the 6.3 amp fuse F603 is open, check the bridge rectifier and filter capacitors D602, C607 and C606, as well as the thermistor and degaussing coil relay contacts for short circuits.

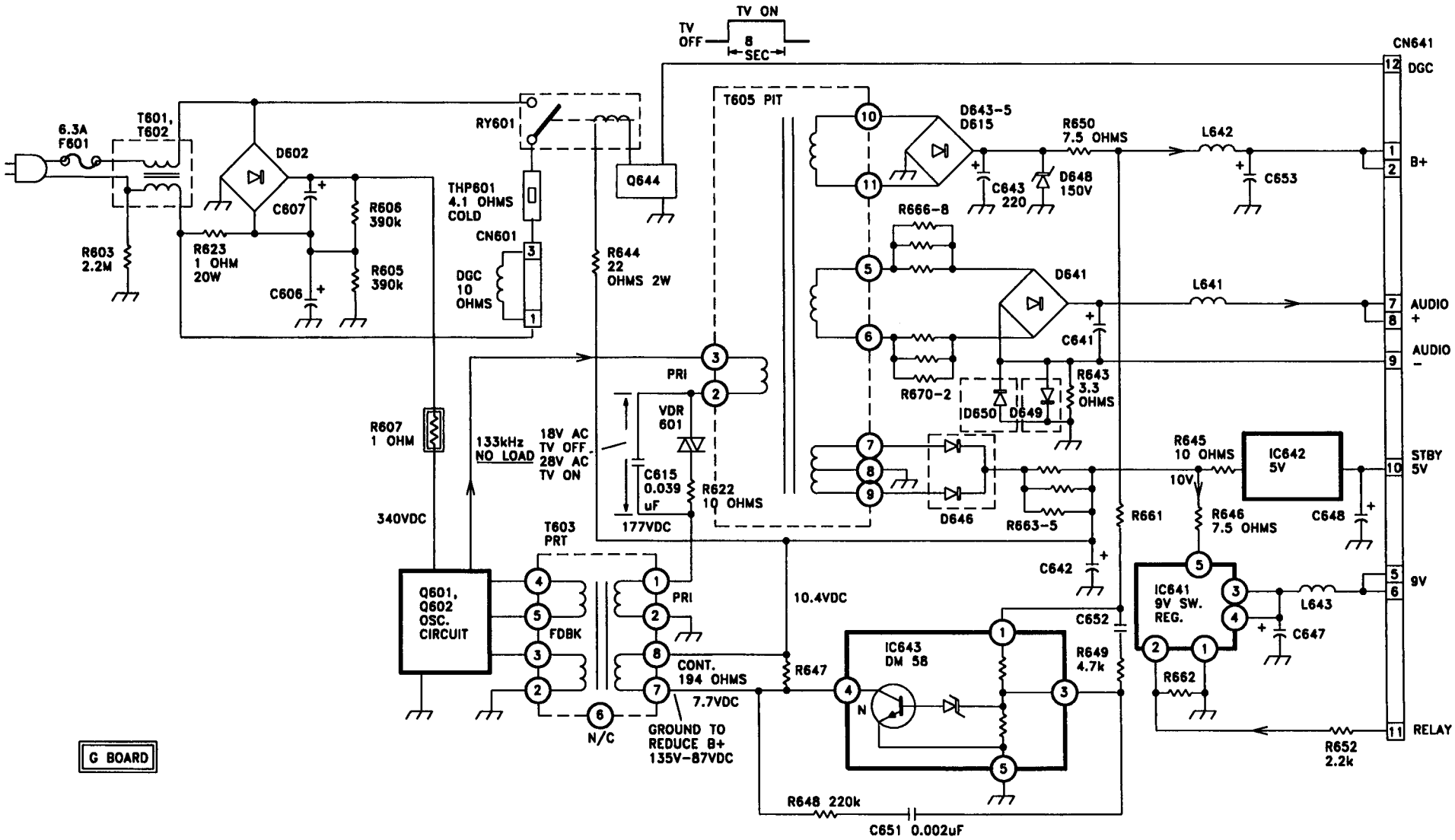
If fusible resistor R607 in series with the oscillator circuit is open, then check not only the oscillator transistors themselves, Q601 and Q602, but also the zener diode at the B+ secondary D648, for short circuits. After replacing these parts, unplug the power supply board and operate it separately (unloaded). On all Sony Direct View TV sets, the power supply will run without a load. This is not true for projection TV sets, which must be loaded at all times.

With the power supply separated from the TV set, it can be tested using an isolated Variac, a DVM, and an oscilloscope.

The oscillator will start with as little as 5Vdc applied to it, in lieu of the 340Vdc that is normally applied to the oscillator circuit. This DC input voltage can be controlled with the AC Variac. The oscilloscope can monitor the output at the primary of the main power transformer T605/pin 3. It should be a symmetrical square wave with the DC voltage at the junction of the oscillator transistors equal to half that of the applied B+ voltage if the waveform is symmetrical. In other words, if there was 10V applied to the oscillator circuit, you would measure 5 Vdc on a DVM if there is a waveform and it is symmetrical. An oscilloscope would show the presence of a symmetrical square wave with the first half of the cycle having an amplitude of 5v above the 5 volt line and the second half of the cycle having an amplitude of 5v below the 5 volt line, thus creating a 5Vdc average level. A lower or higher voltage indicates a defect in the basic oscillator circuit. Also, a low voltage could indicate a short circuit in the VDR601, which would load down or reduce the voltage at the junction or output of the oscillator circuit to T605.

Therefore after replacing defective components, you can use this method to check this power supply stage. Just monitor B+ and junction voltages as you bring up the Variac voltage. Make sure the B+ doesn't rise above 135V. The Variac current should also be monitored (see chart for normal AC current). The moment B+ begins to rise above +135Vdc, the regulator circuit should take over and begin keeping that voltage at 135V. For testing purposes, if you must run the power supply without protection zener diode D648, be careful that you never exceed the 160V rating on the B+ filter capacitor. IMPORTANT: Don't forget to discharge C606 and C607 before plugging in the power supply board, as described in the overview in this section.

Typical AC Power consumption - KV27V35	
Standby (pwr OFF)	0.180 Amp AC
Power ON - Video	0.97Amp AC
Power ON - Snow	1.16 Amps AC
Power ON - Color bars	1.496 Amps AC



POWER SUPPLY/POWER ON

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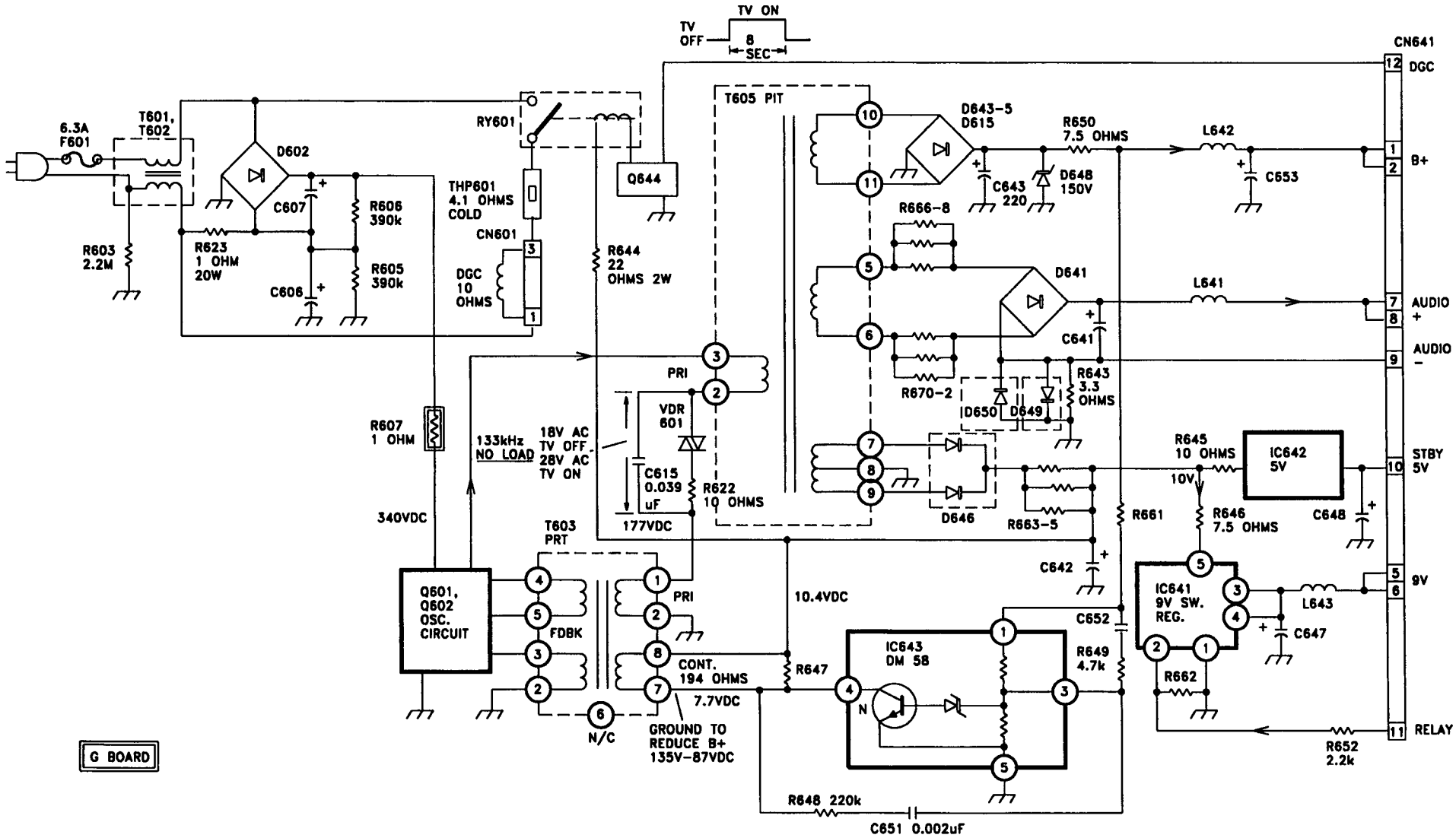
Troubleshooting - Low B+ Voltage

This can be caused by either something loading down the power supply or the power supply regulator section is not functioning itself. If possible, remove the power supply board from its load and operate it separately. It should function and regulate to the voltages given in the chart below. If the voltages are still low with the power supply board unplugged (the loads have been unsoldered in unpluggable sets), then measure the voltage at feedback transformer T603/pin 7. If this voltage is lower than the normal 7.7Vdc, it indicates that the circuitry before this point is defective. Suspect IC643 and its associated components. A higher than normal voltage at feedback transformer T603/pin 7 indicates a problem in the feedback transformer itself, resonate capacitor C615, the main transformer T605, or secondary load.

Resistance Measurements at the Load end of the power supply socket CN1641 (Power Supply board unplugged)		Load Current TV ON, 120V AC
CN1641/pin number	Resistance	Current
1,2 (135V B+)	38k	341mA = video 500mA = snow 676mA = bars
3,4 (Gnd)	0 ohms	Ground
5,6 (Sw +9V)	130 ohms	913mA
7,8 (Audio)	10.6 Meg ohms	53 mA = mono 95 mA = stereo
10 (Stby +5V)	4K ohms	72 mA = start up 66 mA = run
11 (Relay / ON com)	4.5 Meg ohms	
12 (Degauss transistor)	4.5 Meg ohms	



POWER SUPPLY/POWER ON

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POWER SUPPLY OSCILLATOR CIRCUIT

Start

The power supply oscillator will begin functioning as soon as DC voltage is applied to it. The oscillator circuit consists of transistors Q601, Q602, feedback transformer T603, and the main power transformer T605. Voltage comes into the oscillator stage from a bridge rectifier, D602, when plugged into 120V AC. The output of the bridge rectifier and voltage doubler combination consisting of the two capacitors C607 and C606, outputs approximately 340V to the oscillator circuit through fusible resistor R607. The DC voltage is applied to Q601/collector, as well as its base through series resistors R615 and R612.

As the voltage at the base increases, so does its emitter by transistor action. As this voltage increases, current flows from Q601/C-E through the primary of transformer T605/pin 3 and out pin 2. It continues through C615 as the main path through feedback transformer T603/pin 1 to ground at pin 2. Current flowing through this path produces a magnetic field, creating current flow in the main power transformer T605 secondary windings and in transformer T603 feedback winding. A positive pulse feedback signal from T603/pin 4 is applied to Q601/base, turning it ON harder until it saturates. At the same time, a negative going pulse is output T603/pin 3, which is applied to Q602/base. This keeps Q602 turned OFF, so it is not in the circuit during the first half of the oscillator cycle.

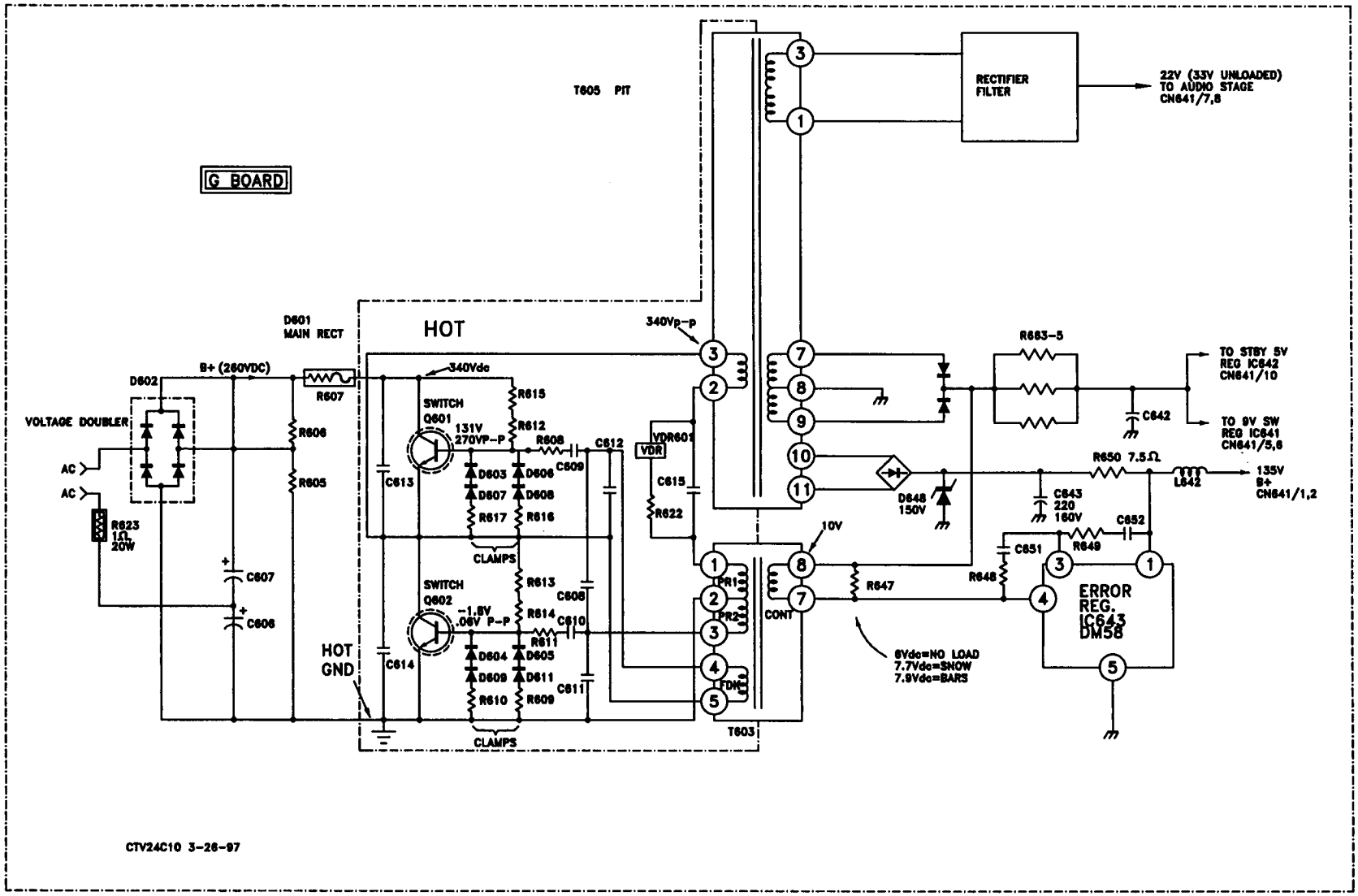
Current no longer flows in this primary path when Q601 is fully saturated (emitter = collector voltage at 340V), and C615 is fully charged to 340Vdc. When there is no longer a change in the magnetic field, the magnetic field stored in the primary of both transformers T603 and T605 will collapse, causing a reverse voltage. When the field collapses, the polarity of the voltages that are output from the feedback transformer are reversed, causing a negative voltage to appear at Q601/base, shutting it off; and a positive voltage to Q602/base, turning it ON. When Q602 turns ON, it discharges the 340V stored in capacitor C615. The voltage at the junction of the two transistors, Q601/emitter and Q602/collector, then decreases from 340V down towards 0, completing the other half of the oscillator cycle. This resultant sine wave signal is present at the primary of T605 and is induced into its secondaries to produce the various voltages required for operation of the TV set.

Regulation is achieved by monitoring the +135Vdc B+ line, at error regulator IC643/pin 1. IC643 monitors this line and varies the current through the control winding of T603 (pins 8 and 7), which is connected to IC643/pin 4. If an increase in B+ voltage is sensed, the voltage at error regulator IC601/pin 4 is reduced, this increases the current through the control winding. By increasing the current through the control winding of transformer T603, the frequency of the oscillator changes. The efficiency or output of the main power transformer T605, changes with frequency. Thus, the transformer becomes less efficient causing the output voltage to reduce to the correct +135Vdc level. This process continues to regulate the 135 Volt supply.

Protection

Q601 and Q602 are the oscillator transistors that are subjected to voltage spikes from external power line and internal transients, developed through inductors that have expanding and collapsing magnetic fields. These spikes can easily arc over the junctions of the transistors, causing them to fail by exceeding their voltage ratings. Therefore, it is essential to reduce these voltages. There are three different ways used in this oscillator circuit to do this:

1. Capacitors C613 and C614 are used to reduce spikes applied to the emitter junction of the two oscillator transistors. When a voltage spike appears, it is used to charge these capacitors, reducing the voltage so it doesn't exceed the breakdown voltage of the transistor.
2. Diodes at the base of oscillator transistors prevent reverse voltage from appearing at these transistor's base-emitter junction.



OSCILLATOR CIRCUIT

A reverse voltage between 8 to 10V will puncture the base to emitter junction of a transistor. So by placing these diodes accordingly, no reverse voltage can be applied to these junctions.

3. Voltage spikes from the feedback transformer T603 should be smoothed out. This is achieved with the aid of filter capacitors C612, C611 and C608.

Intermittent failure of oscillator transistors:

VDR601 is designed to protect main capacitor C615, so the voltage applied across it does not exceed its breakdown voltage. If protection VDR601 opens up, usually caused by lightning, R622 normally opens. This can cause intermittent failures of Q601 and Q602, the same as if protection capacitors C611, C608 and C612 would open up. Capacitors C613 and C614 protect the oscillators transistors from abnormally high spikes, such as during lightening strikes. They could be open and the oscillator circuit will work fine, but the oscillator circuit will be damaged at the next lightening storm since there is no longer any protection.

Instant failure of oscillator transistors:

The diodes at the base of the two transistors are necessary all the time, therefore, if a group of them opens, there will be instantaneous failure of the transistors at turn ON, as opposed to intermittent failures or failure during lightening storms, from the other protection component failures.

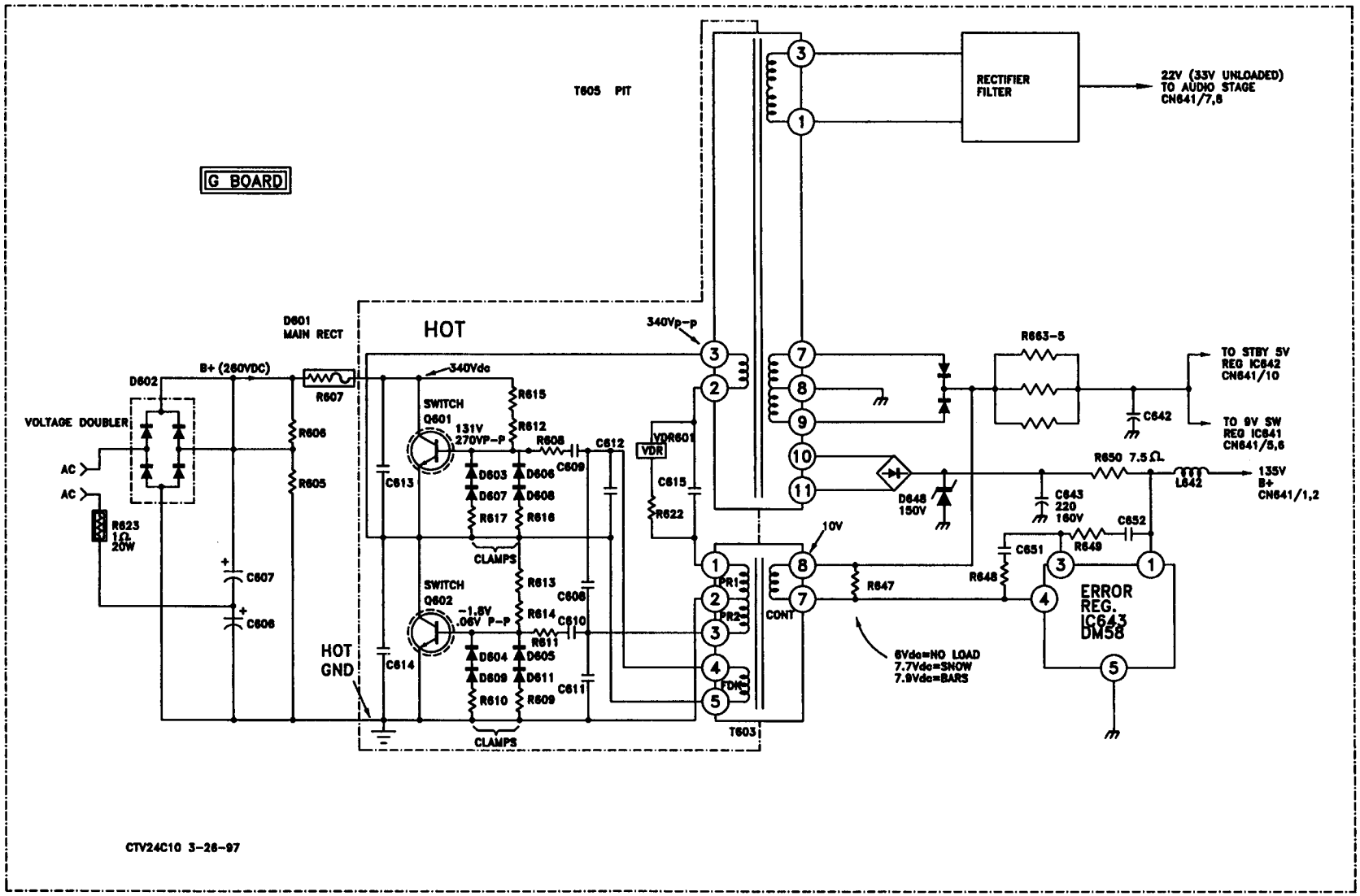
SONY AA-2 TV Chassis Power Supply Output Voltages - load unplugged							
Primary (gnd = C606 neg end)			Secondary (gnd = E at output socket CN1641/pin 3,4)				
Variac controlled AC Input Voltage	AC Current (no load)	Oscillator Frequency	135Vdc B+ Voltage	9V output (switched)	Audio * no load	Stby 5V	135V B+ output with soft start Q645 shorted
20Vac	160ma AC	57 kHz	67Vdc	0Vdc	30Vdc	3.45Vdc	31Vdc
30Vac	323ma AC	53 kHz	110Vdc	0Vdc	30Vdc	5Vdc	37Vdc
36Vac	342ma AC	53 kHz	135Vdc	0Vdc	33Vdc	5Vdc	39Vdc
40Vdc	287ma AC	55 kHz	135Vdc	0Vdc	33Vdc	5Vdc	39Vdc
50Vac	188ma AC	61 kHz	135Vdc	0Vdc	33Vdc	5Vdc	54Vdc
120Vac	76ma AC	133 kHz	135Vdc	0Vdc	33Vdc	5Vdc	113Vdc

* 23 Vdc with power supply (loaded) connected and set running - no sound output.

Repair

Testing and repair of this stage is based on this oscillator stage that will begin to oscillate with as little as 5Vdc applied to it instead of the normal 340V. Using a Variac, DC voltmeter and possibly a scope, we can test and monitor the oscillator's condition as the voltage is increased to this oscillator stage.

1. Plug the set into an isolated AC Variac transformer, with an AC ammeter, voltage turned down to 0VAC.
2. Place a voltmeter and scope at the emitter of Q601 or the collector of Q602.
3. Bring up the AC Variac voltage so that 5Vdc appears at the collector of Q601 or the fusible resistor R607.
4. The oscillator should start and there should be a square wave at the junction of the two transistors at Q601/emitter. The waveform should be symmetrical and if it is symmetrical, then 2.5Vdc, half the applied voltage of 5Vdc will appear at that junction. The oscilloscope is used to determine if a waveform is present and to verify symmetry.



OSCILLATOR CIRCUIT

5. As the voltage is increased on the Variac, the voltage at the junction of the two transistors will always remain at half the B+ level, as long as the oscillator section is outputting a symmetrical waveform.
6. While bringing up the voltage on the Variac, you should always monitor the AC current consumption as well, to make sure it is not excessive. This is because you're only monitoring the center voltage which determines if the waveform is balanced. You also need to determine if the total consumption of the power supply is abnormally high or abnormally low revealing a short (load) to the power supply.

In this testing method, the Variac voltage can be brought up to the full line voltage so that 340V will appear at the oscillator circuit and half that voltage (+170Vdc) at the junction of the two transistors, proving that the oscillator waveform is symmetrical. It is best to do this with the power supply board only. With it plugged to the set, Syscon may turn ON the TV at about 50Vac (when Syscon gets Stby 5Vdc operating power). To prevent this, the 9V choke L643 can be removed.

Non-Symmetrical Waveform

If the voltage between the two transistors (Q601/E & Q602/C) is not half B+ at any point of the testing (above), it means the waveform is not symmetrical. A non-symmetrical waveform is the result of an imbalance of the oscillator stage. This can be caused by leakage in any one of a number of components in this stage. Common failures are the 50V C611, C612 and C608 capacitors at the bases of the oscillator transistors, as well as the VDR601. Coupling capacitors C609 and C610 have also been found leaky, upsetting the bias, causing the imbalance as well. They usually get leaky and cause intermittent failures of Q601 and Q602 because one of the transistors gets abnormally hot and the other one tends to assume the load for as long as it can until they both fail.

SONY AA-2 TV Chassis Power Supply Output Voltages - load unplugged							
Primary (gnd = C606 neg end)			Secondary (gnd = E at output socket CN1641/pin 3,4)				
Variac controlled AC Input Voltage	AC Current (no load)	Oscillator Frequency	135Vdc B+ Voltage	9V output (switched)	Audio * no load	Stby 5V	135V B+ output with soft start Q645 shorted
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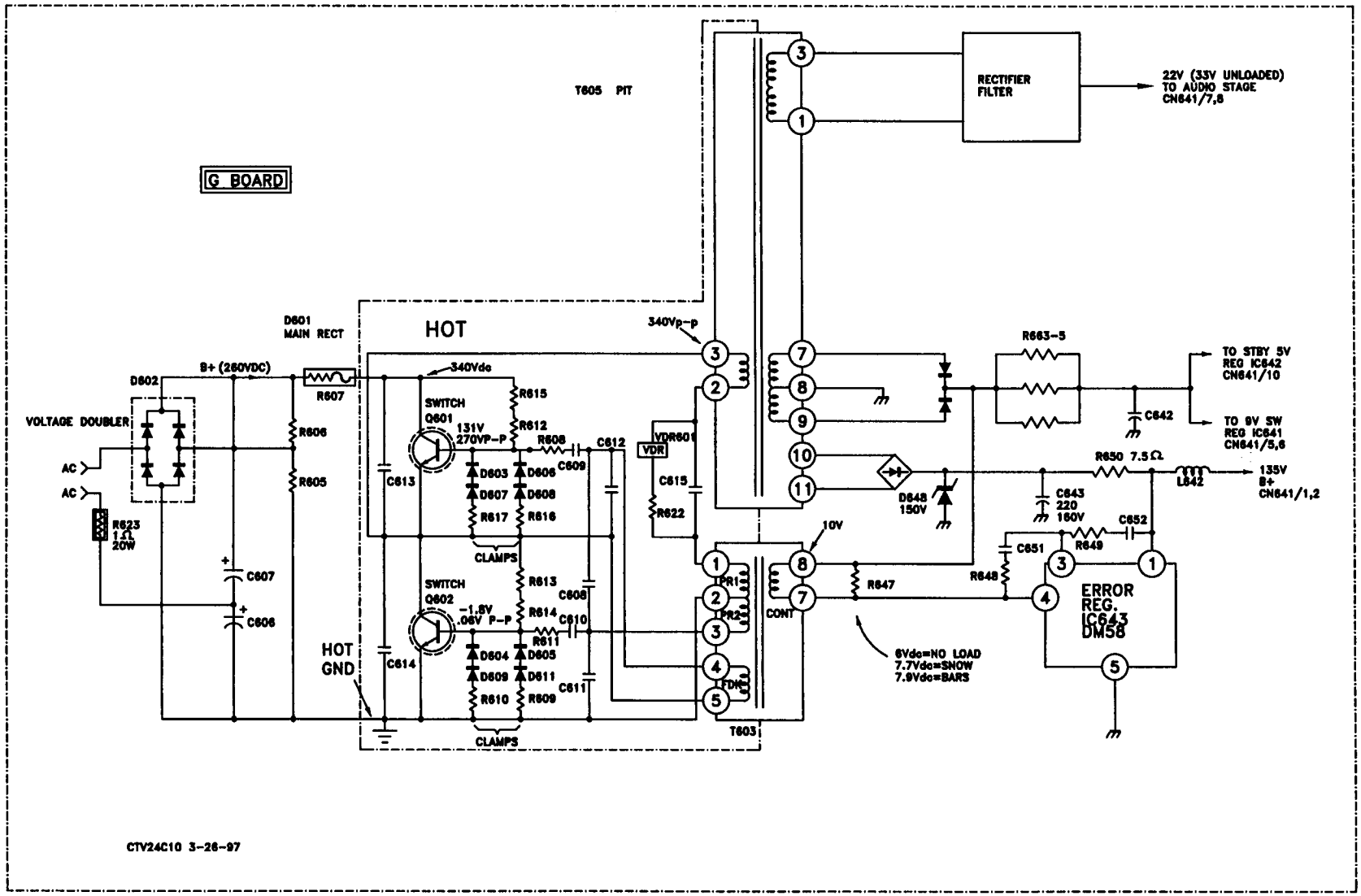
40Vdc	287ma AC	55 kHz	135Vdc	0Vdc	33Vdc	5Vdc	39Vdc
50Vac	188ma AC	61 kHz	135Vdc	0Vdc	33Vdc	5Vdc	54Vdc
120Vac	76ma AC	133 kHz	135Vdc	0Vdc	33Vdc	5Vdc	113Vdc

* 23 Vdc with power supply (loaded) connected and set running - no sound output.



OSCILLATOR CIRCUIT

H. V. START / PROTECTION

Overview

At power ON, when the system control's microprocessor IC001 turns ON the 9V power supply, it is applied to the Jungle IC351/pins 8 and 36. At this time, the X354 crystal oscillator starts and horizontal pulses are output to develop horizontal sweep and high voltage.

The input to Jungle IC351/pin 38 is not only used for picture centering (H output pulses), but also to shut down the TV set (DC voltage), in case the flyback voltage or the 135V B+ current demand is excessive.

HV voltage fluctuations caused during channel changing (in-between stations) where there are rapid brightness changes is minimized by Q358 and associated circuitry. Abrupt voltage changes of the RGB signals in between stations are fed back to the IC351/pin 40 AFC FIL(ter), to regulate the horizontal oscillator. Since the horizontal oscillator signal's frequency is used to make HV, this oscillator control minimizes shifts in HV (fast response ABL).

Power ON

When the set is powered ON, 9V appears at the Jungle chip at IC351/pins 8 and 36, permitting the 503KHz crystal X354 to turn ON. This frequency is scaled down and used as reference for the horizontal oscillator VCO that is internal to the Jungle chip IC. Horizontal pulses that output Jungle IC 351/pin 37 are 5V peak-to-peak pulses at a frequency of 15,734 Hz. This horizontal signal is amplified by Q501 to appear as a 200 Vpp signal at it's collector. After passing through T501 and R573, the horizontal signal is reduced to a 4Vp-p level. This signal is applied to the base of the horizontal output transistor Q502, which in turn feeds the flyback to develop high voltage and the deflection yoke horizontal deflection.

AFC Phase correction

In order to make sure the picture is centered on the screen, a sample of the horizontal output pulse is fed back into the Jungle chip at IC351/pin 38, for comparison to the input video signal's horizontal sync (not shown). The two are compared in IC351 and the phase synchronized horizontal drive signal outputs from pin 37.

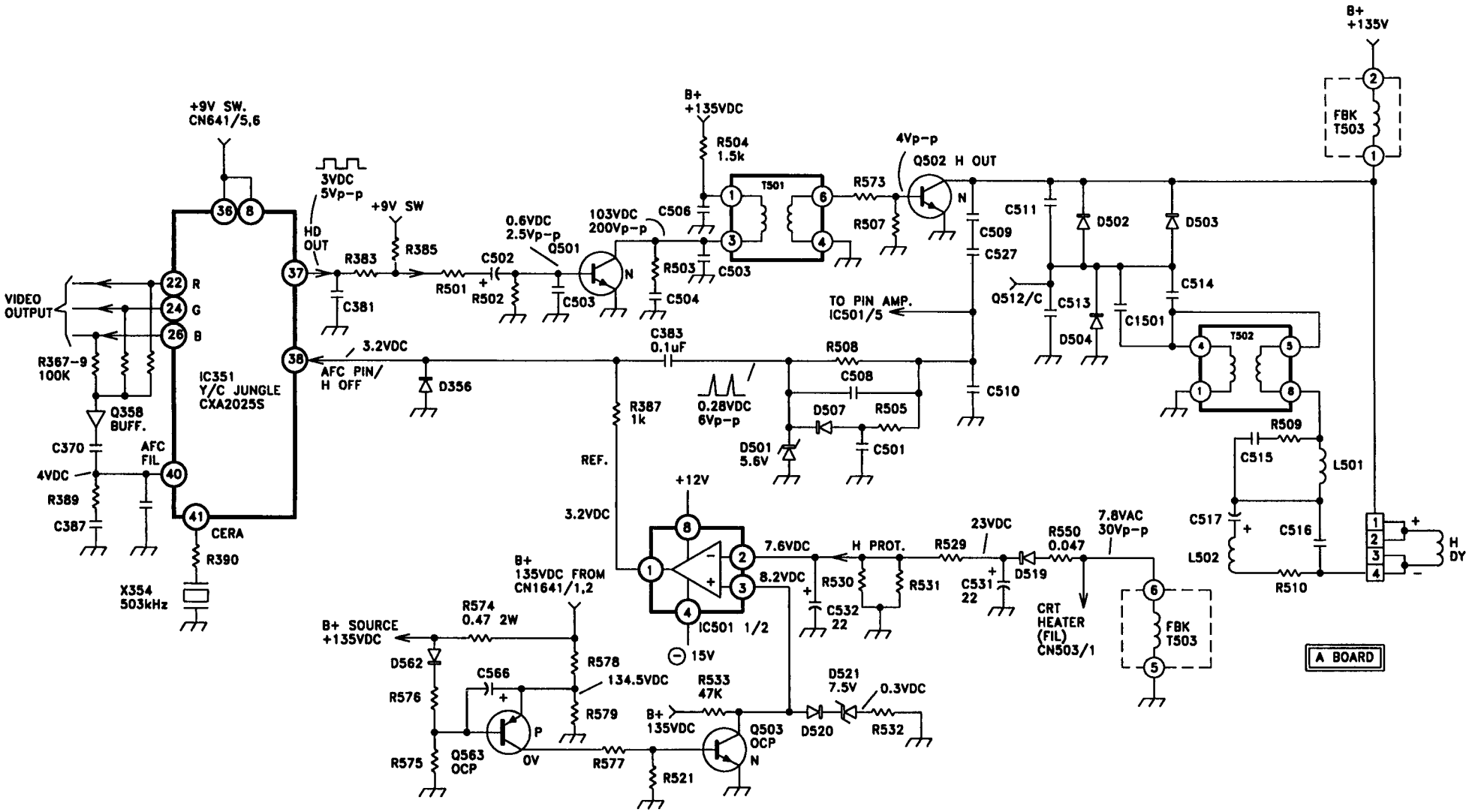
The processing of this signal is as follows: the sample feedback signal from the horizontal output transistor Q502/collector is applied through C509 and C527 to RC network comprised of C510, R508, C508, R505, C501. This sharp pulse is reduced in amplitude by the R-C network so it appears as a 6V positive-going pulse at the cathode (banded end) of zener diode D501. The pulse is AC coupled through C383 and applied to the Jungle chip at IC351/pin 38. Protection diode D356 is connected to pin 38 to protect this IC351 from a negative-going voltage, which can be produced by the fast fall time of this pulse.

Protection

A protection circuit monitors both the:

1. +135V B+ line current
2. flyback signal amplitude level

If an excessive level is detected, the protection circuit connected to this pin via R387 activates, thus grounding IC351/pin 38 through a 1K ohm resistor. This action, internally stops the horizontal drive pulses from being output at IC351/pin 37 and reduces the DC voltage at pin37, from 3Vdc to 1.2Vdc. The removal of horizontal drive shuts down the HV circuit. The Jungle IC remains latched OFF until +9Vdc is removed and reapplied at the Jungle IC351/pin 36 & 8.



HIGH VOLTAGE STARTUP/PROTECTION

CTV24J2 509 2 11 97

1. 135V B+ Current Monitoring protection circuit:

This circuit consists of Q563 and Q503, along with op amp IC501. Its purpose is to monitor the current drawn by the 135V B+ line and shut off the horizontal drive if excessive. The circuit works this way: The entire 135V B+ supply current flows through a small 0.47 ohms, 2 watt resistor, R574. The voltage drop across this resistor is proportional to the current drawn. This voltage is applied to the base and emitter junctions of Q563 through resistors R578, R576 and diode D562. If the voltage drop across R574 exceeds 1.2V, then the transistor will turn ON and its collector voltage will rise, initiating the shut down of the high voltage section. Capacitor C566 across the base of the main junction suppresses transients or surges that occur during the normally seen brightness changes, thus preventing premature tripping of this circuit.

The positive voltage that is output Q563/Collector will be applied through a voltage divider network into the base of Q503. The positive voltage turns ON Q503 and its collector will drop to 0Vdc. This collector voltage is tied to the reference voltage (8.2Vdc), used by IC501/pin 3. If the reference voltage drops below the other Op amp input voltage at pin 2, (7.6Vdc), then IC501/pin 1 will output a LOW. This LOW grounds out the DC voltage from the Jungle chip IC351/pin 38 via R387 and the horizontal drive stops.

This stage will shut OFF the high voltage, if for any of the following conditions occur: a leaky H. Output transistor, shorted flyback transformer, load on the flyback secondary (CRT short/arcing, rectifier leaky, RGB output transistor shorted), B+ too high, or a defect in the Q563 and Q503 current monitoring circuitry.

2. Flyback Voltage monitor protection circuit:

The flyback winding used to power all three filaments of the CRT is also used to feed the protection circuit. This signal is normally a 30Vp-p flyback pulse, which is coupled to the protection circuit via a 0.47 ohm resistor, R550. The signal is rectified by D519, filtered by the R-C network that follows, which also reduces the resultant DC voltage from 23Vdc to 7.6Vdc. This voltage is applied to IC501/pin 2 for comparison to the reference voltage at pin 3. The 8.2V reference at pin 3 is fixed by the voltage divider, consisting of R533 and the zener diode D521. D520 is placed in series with zener, D521, for temperature compensation.

If the voltage at IC501/pin 2 rises above 8.2Vdc, (the reference voltage at pin 3), the output of the operational amplifier IC501/pin 1 grounds out the 3.2V that comes from the Jungle IC315/pin 38. This action stops the Jungle IC from outputting horizontal drive signals from pin 37, thus removing high voltage. Please note, the audio circuit will continue to operate.

Examples of defects which could cause increases in HV are as follows: The B+ voltage is high, safety capacitors C511/C513 have opened or changed value, wrong FBT or Q502 H output was installed, horizontal frequency off or R-C parts in the FBT primary have changed value.

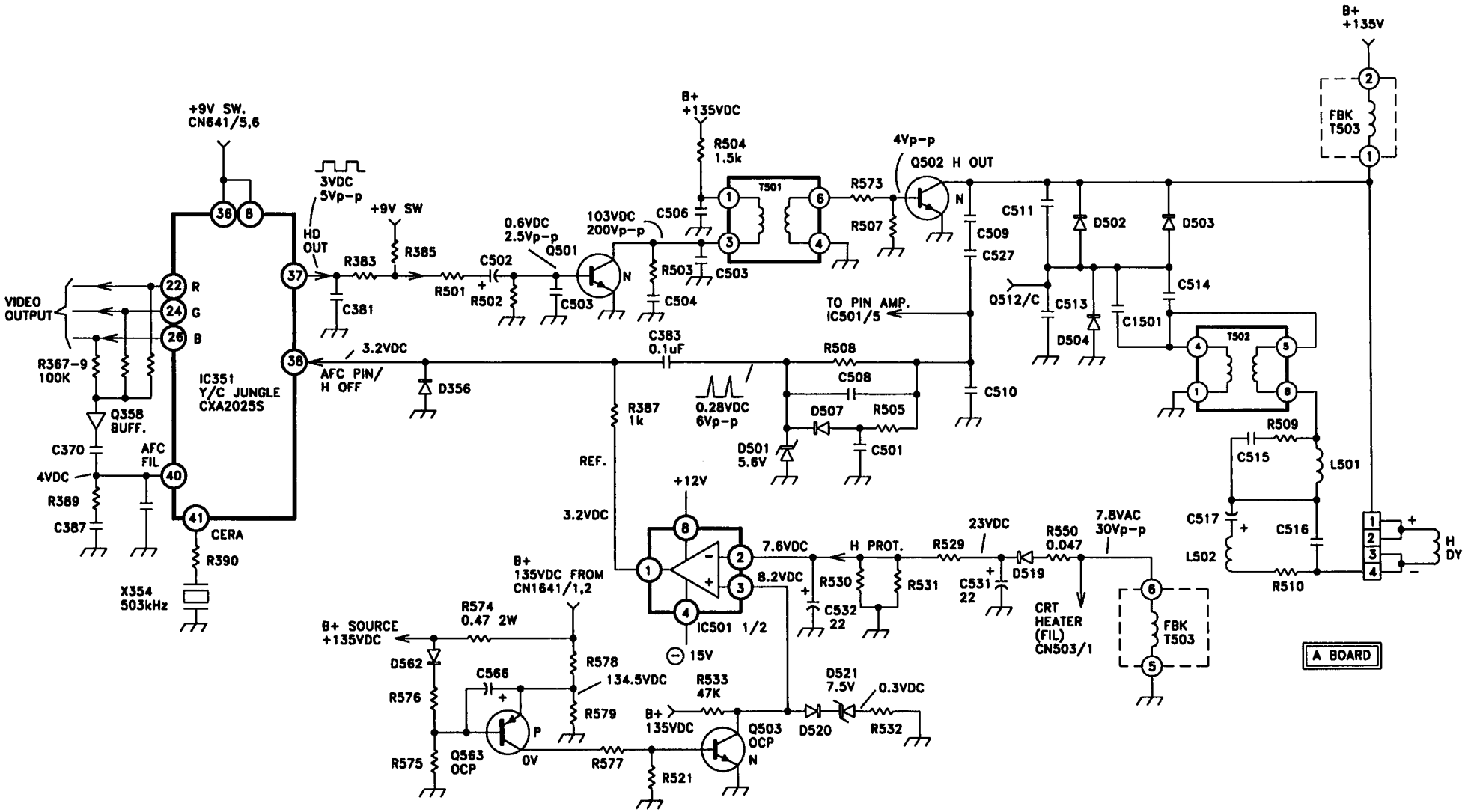
Troubleshooting

Symptom:

In this new Sony AA-2 chassis, If the high voltage has stopped because of the above protection circuit, the symptoms are as follows:

1. Dark screen
2. TV/video Sound OK and controllable
3. Timer light blinks
4. No horizontal pulses output IC351/pin 37

Please note: If the 135 Vdc supply voltage is missing, the screen will also appear dark (no picture), with sound, however horizontal pulses will output IC351/pin 37.



HIGH VOLTAGE STARTUP/PROTECTION

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Troubleshooting: Where to start:

The easiest place to start is to check for 9Vdc coming into the Jungle chip, IC351/pin36. This starts the horizontal oscillator that outputs the horizontal drive signal from pin 37.

If no horizontal pulses output pin 37, one of these IC inputs is incorrect or missing:

1. + 9Vdc (pin 36),
2. X354 oscillation (normally = 0.1Vp-p at pin 41) or
3. IC351/pin 38 - normal = 3.2Vdc. defective = 2.8Vdc.

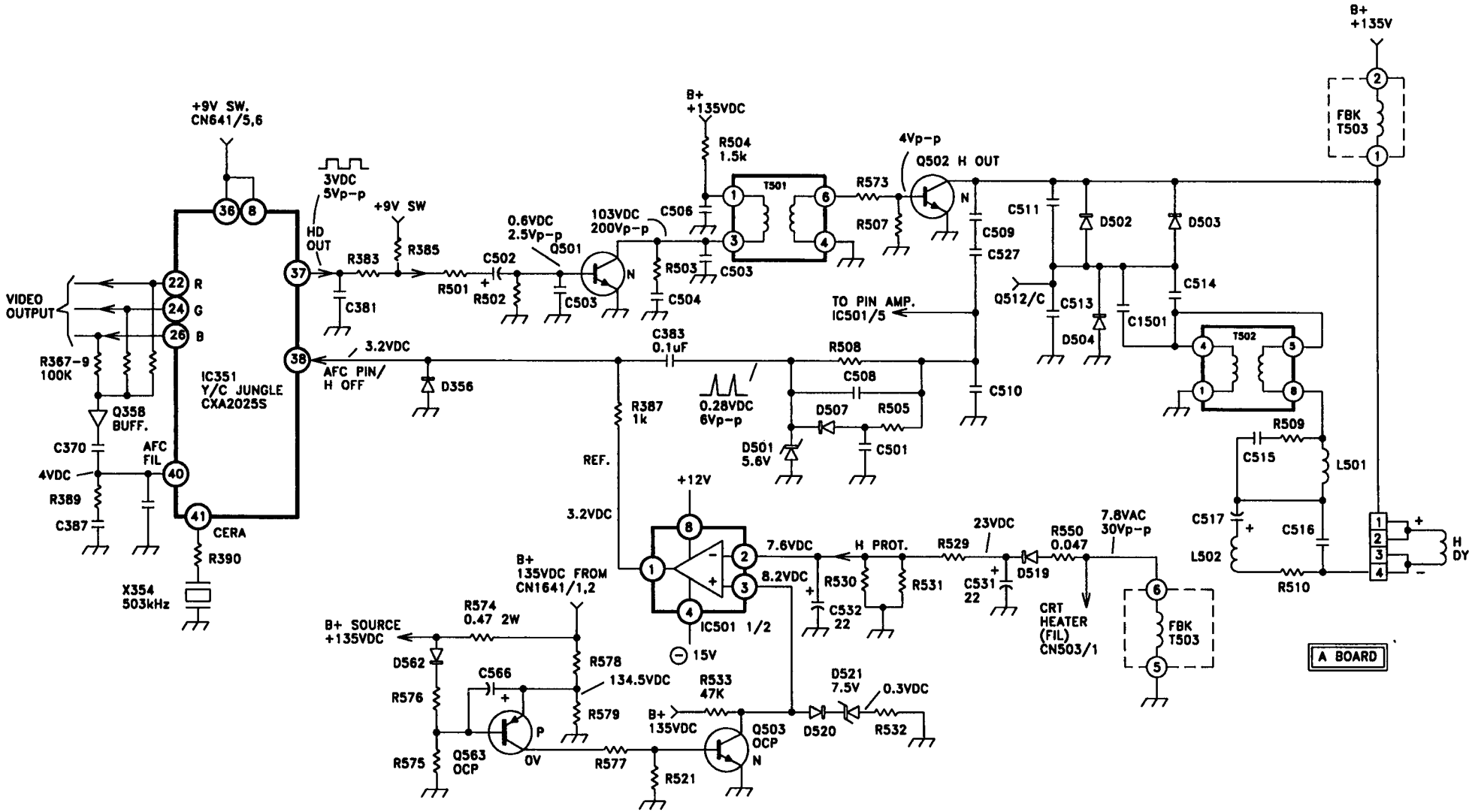
The DC voltage at pin 38 is normally 3.2Vdc from within the IC351. If pin 38 was momentarily grounded from one of the 2 protection circuits, this voltage will reappear as 2.8Vdc. Meanwhile there would be no horizontal drive signal from IC351/pin 37 and this pin's DC voltage will be latched to 1.2Vdc (normally = 3Vdc).

How to find the cause:

Once this symptom has occurred, the high voltage is shut OFF so the clues to determine what tripped the protection circuit are gone. You may be able to circumvent this dilemma by putting the set on a Variac and keeping the AC voltage reduced below the shut down point. This will allow you time to measure the voltages to see how close they are to critical. The critical voltages that will activate shut down are given in the chart below.

Horizontal Drive Shutdown Trip Point Voltages		
	Normal	Trip point
IC351/pin 38	3.2Vdc	0Vdc
IC501/pin 2	7.6Vdc	8.2Vdc
D519 Cath (Banded) end	23Vdc	24.7Vdc

Under severe conditions, you can also reduce the B+ voltage by grounding the output of the regulator IC643/pin 4 to keep the 135V B+ voltage down to about 37Vdc. Then you can use the Variac to generate the various voltages required to determine what circuits are tripping and shutting down the TV set's high voltage.



HIGH VOLTAGE STARTUP/PROTECTION

CTV24J2 509 2 11 97

PINCUSHION

Overview

Without the pincushion stage, the TV's toroidal yoke would deliver a picture shaped like an hourglass. The pincushion stage generates a signal which is opposite of the hourglass deflection and increases the amount of current through the deflection yoke non-linearly. This signal modulates the horizontal drive signal which generates a width increase like a pincushion to compensate for the hourglass effect of the yoke. Therefore, the correction circuitry needs to manufacture a parabola signal at a vertical scan rate to increase the horizontal deflection more and more as we reach the center and less and less as we scan to the bottom of the screen. This correction signal is a 60Hz half round waveform from the Jungle IC's "east/west" pin 33.

In order to insert this 60Hz parabola signal into the much higher frequency horizontal yoke circuitry, it must be inserted line by line. Therefore, a horizontal frequency is needed, so the 60Hz signal can be applied line by line. The amplitude or amount of pincushion correction signal is controlled or stored in the memory IC. This information is accessed by micon IC001 (not shown) and fed into the Jungle chip via serial data to set the parabola level. The pincushion signal that's output is amplified and applied to the output of the horizontal stage where it changes the amount of current through the yoke using transistor Q512.

Because the pincushion stage increases the amount of current flowing through the yoke, and thus through the flyback transformer, there is a corresponding change in high voltage and brightness levels. These changes in beam current must be compensated for by the ABL circuitry. The ABL circuit feeds a small amount of AC voltage, representative of beam current, back into the pincushion stage to level out the brightness changes. In addition, a small amount of this ABL signal is also fed back to the Jungle chip for protection, to limit the brightness, avoiding an excessively bright screen.

East/West Drive

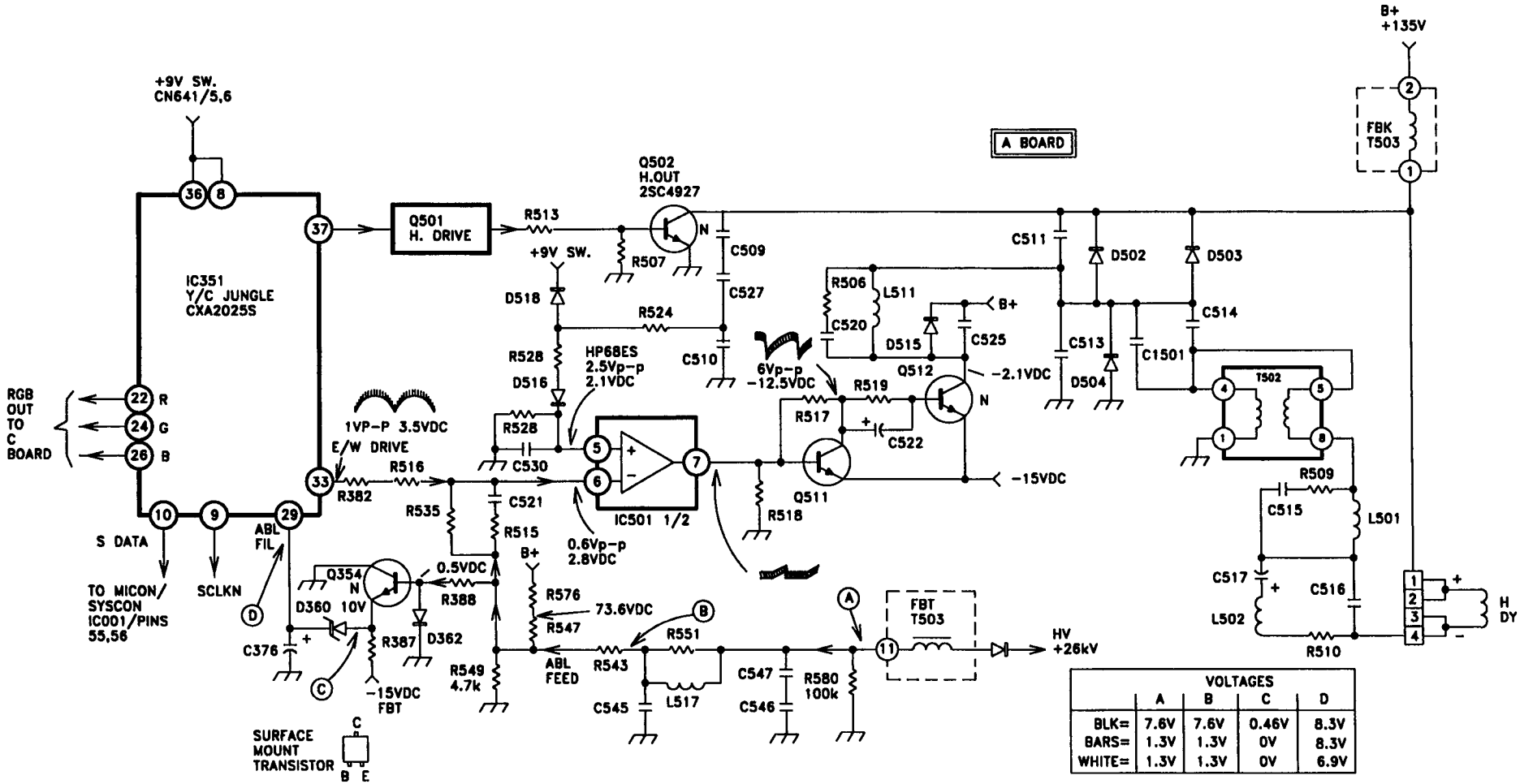
The East/West drive signal is a 60hz parabola signal that is manufactured by the Jungle IC351/pin 33. Its amplitude is controlled by the data stored in the memory IC (not shown) and sent into Jungle IC351/pin 10 by micon/syscon IC001 (also not shown). The 60Hz signal that is output at the Jungle IC351/pin 33 is applied to the operational amplifier IC501/pin 6. It is combined with horizontal pulses entering at pin 5, so the 60Hz parabola can modulate the horizontal sweep later on. Therefore, the output of IC501/pin 7 is a mix of horizontal and vertical signals.

The horizontal input signal at pin 5 must be reduced in amplitude so as not to damage the operational amplifier. Clamping diode D518 prevents the spikes from exceeding 9V positive. The small R-C network consisting of R528 and C530 reduces the sharp spike of the horizontal pulse from the horizontal output transistor before it's applied to IC501/pin 5.

The mix of horizontal and vertical signals outputs IC501/pin 7 and is applied to Q511, which amplifies this composite signal and applies it to the pincushion driver transistor Q512. Q512 introduces this signal into the junction of damper diodes D502 and D504. Note that the two top damper diodes, D502 and D503, are in parallel. Only one damper diode, D504, is connected to ground at this junction. The remainder of the current flows through pincushion driver transistor Q512. The increased current drawn by pincushion driver transistor Q512 draws more current through the horizontal deflection yoke when it is turned on. This increases the horizontal scan, to compensate for the hourglass scan created by a toroidal yoke.

ABL Feedback

The ABL feedback from the flyback transformer is a voltage that decreases as the brightness increases. This voltage is used to prevent drastic brightness changes, also preventing damage to the CRT.



VOLTAGES	A	B	C	D
BLK=	7.6V	7.6V	0.46V	8.3V
BARS=	1.3V	1.3V	0V	8.3V
WHITE=	1.3V	1.3V	0V	6.9V

PINCUSHION

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The ABL voltage comes from the junction of flyback transformer T503/pin 11 and R580. This voltage varies inversely proportional to the brightness. The voltage is filtered by the Pi network that follows and is applied to R543. R543 is a fusible resistor that applies the ABL voltage to the junction of a R547 and R549 voltage divider that normally maintains 6.5V at that junction. The ABL voltage that is introduced alters this voltage. The product passes through R535 to operational amplifier IC501/pin 6 preventing rapid changes to the yoke / flyback current.

The ABL signal is also used to limit the brightness on the screen. This is useful in case a very bright flash of light is transmitted. The ABL voltage at the junction of the voltage divider at R547 and R549 is not only applied to the pincushion operation amplifier IC501/pin 6, but also to Q354/base. This buffer has the ABL voltage applied to its base and outputs at the emitter. When the brightness becomes excessive, the emitter voltage lowers, forward biasing the zener diode D360, when 10V appears across it. This in turn reduces the voltage at Jungle IC351/pin 29 to limit the brightness level of the RGB signal that is output.

Troubleshooting

Shutdown

A shorted Q512 will cause excessive current drain on the 135V line, causing the unit to shut down. Other causes of shutdown that are more common are a leaky / shorted horizontal output transistor Q502 and/or shorted turns in the flyback transformer T503.

Hourglass Picture

Loss of signal into the pincushion drive stage will result in an hourglass picture. If this symptom occurs, check for both the 60 Hz parabola signal and for the horizontal pulses that must be used to integrate the low frequency vertical signal into the horizontal sweep section at pins 5 and 6 of IC501. They both must be present for the pincushion stage to operate. The last place that these two signals can be seen it at the base of Q512. This pincushion signal is masked at its collector by the much larger horizontal pulse.

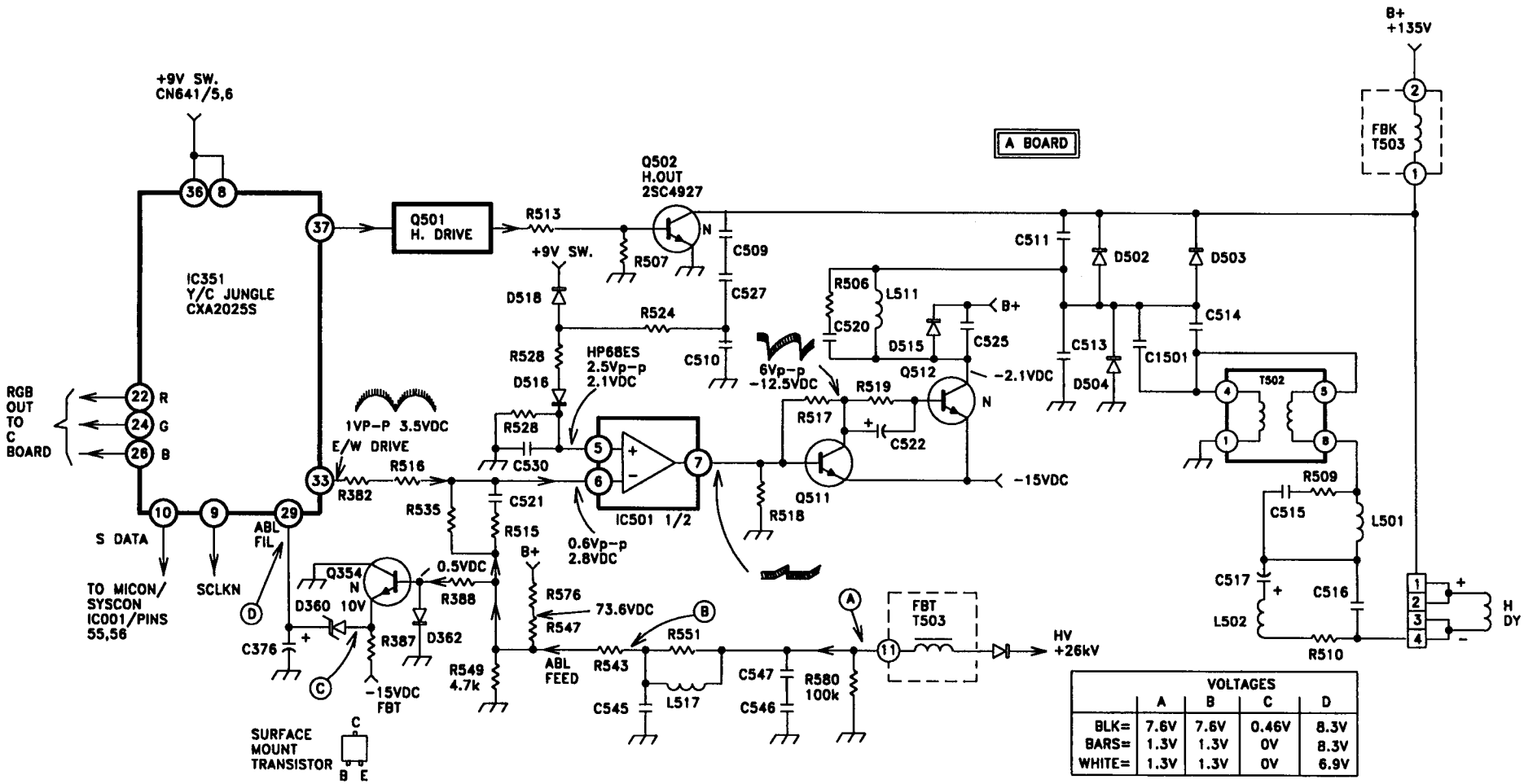
Drastic Changes in Brightness

Brightness limiting is achieved by feeding the ABL signal back into this pincushion stage and the ABL filter line. A loss of pincushion voltage change can be easily tracked down by monitoring for changes in ABL voltage between snow picture (no signal) and no station scenes (minimum of picture information, such as a dot pattern) and a color bar pattern. The results of an ABL circuit failure may cause damage to the picture tube or arcing, periodic shorts to an RGB output transistor or unexplained oscillator transistor failures. If any of these symptoms occur, please verify proper ABL operation.

The voltages to test the ABL section for minimum and maximum picture brightness are given at:

1. R543 of the diagram,
2. junction of the ABL resistor R580 at FBT T503/pin 11.
3. IC351/pin 29

A very, very bright picture should be limited by the ABL voltage using Q354 to provide a reduced voltage at the Jungle IC351/pin 29.



VOLTAGES	A	B	C	D
BLK=	7.6V	7.6V	0.46V	8.3V
BARS=	1.3V	1.3V	0V	8.3V
WHITE=	1.3V	1.3V	0V	6.9V

PINCUSHION

CTV24J1 508 2 10 97

BLANKING 1 / VERT DEFLECTION

Overview

Once the unit is turned ON and high voltage appears, the picture remains blanked until these conditions are met in this order:

1. Vertical deflection signal must be present,
2. Serial data & clock signal is transferred between Syscon/Micon & Jungle IC;
3. Picture tube's IK white balance return signal is present and within balancing range and
4. There must be video input to the Jungle IC (dark screen like blanking).

Without vertical deflection, there will only be sporadic serial data output the Syscon IC (#2 above) and then the Jungle IC's IK circuit will not begin checking the CRT for beam current (#3 above). The vertical oscillator is within the Jungle IC. It starts when +9Vdc powers it. The vertical oscillator will output drive signals into the vertical output IC. The output IC is direct coupled to the deflection yoke for scan. The output IC has a feedback signal that is used by the Jungle IC to prove there is vertical operation for the blanking circuit. Therefore if there is a vertical failure, the Jungle IC will not output anything at the RGB output pins (not shown), preventing a CRT line burn.

Vertical Start

When the set is powered ON, 9V outputs the power supply board and is applied to the Jungle IC351/pins 8 and 36. Jungle IC351/pin 35 has a 0.1 ufd C378 capacitor to generate the vertical sawtooth ramp for this vertical oscillator. Once the oscillator functions, the East/West drive pincushion signal and the vertical timing pulses output the Jungle IC351 at pins 30 and 33 respectively. At this time, if the Jungle IC351/pin 31 and pin 32 are both at approximately 3Vdc (2Vdc indicates a defect), then 1.5V p-p of vertical drive signal of opposite polarity output to IC561/pins 1 and 7. These ramps are amplified and output at pin 5 to the vertical deflection yoke. In order to make sure the larger flyback pulse portion of the vertical signal is not compressed by the output IC's $\pm$ 15Vdc supply voltage, this IC also makes a boost voltage that is only used during this flyback interval. This is created within vertical output IC561 and visible at pins 3 which is coupled into pin 6, to become the boost voltage. Failure in C565, blocking diode D561, that brings in the Vcc voltage for the boost to build upon or IC561 itself will cause the flyback pulse to be reduced in amplitude producing a non-linearity or vertical foldover.

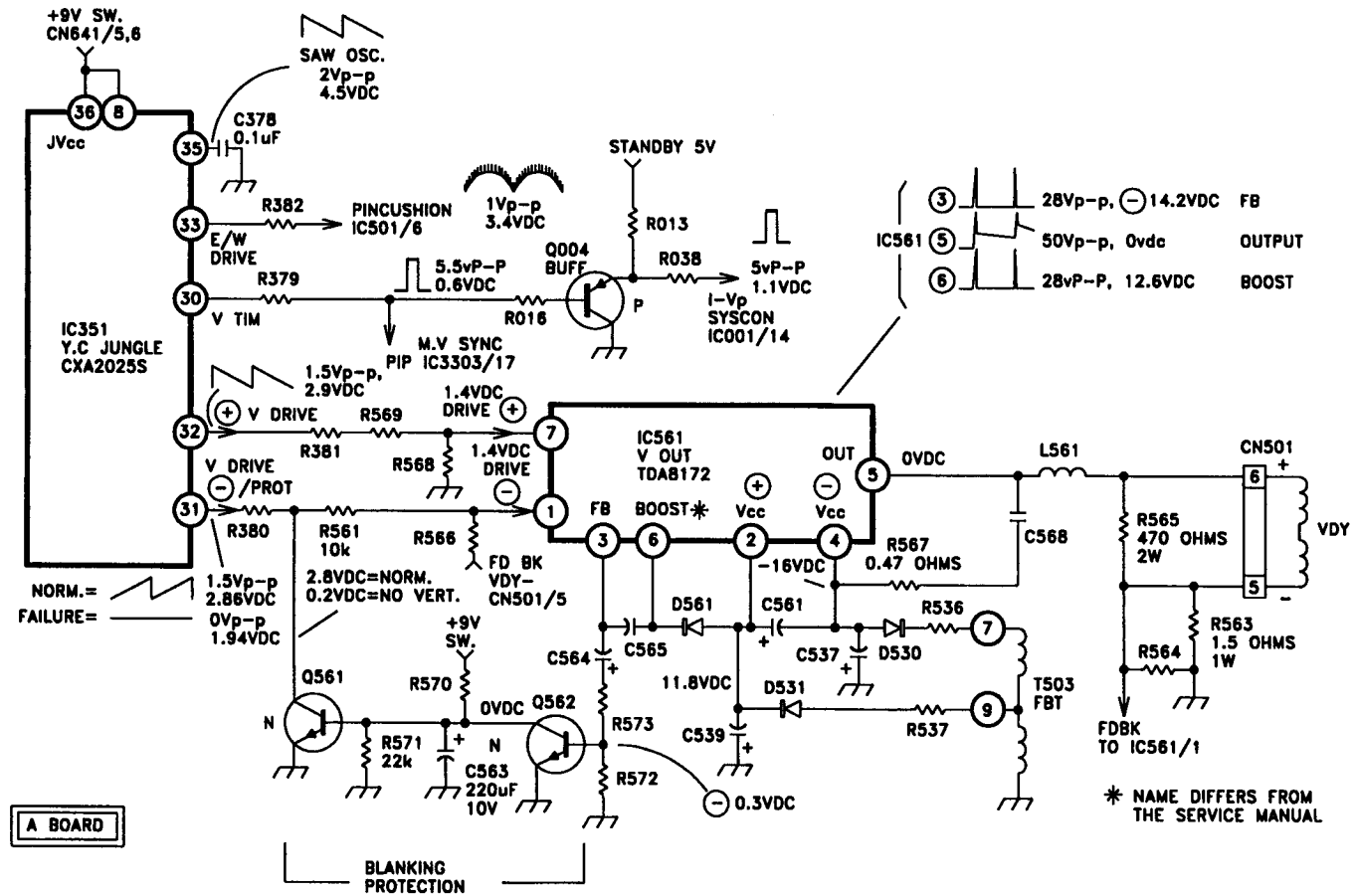
Vertical blanking

One of the purposes of the blanking circuit is to prevent the CRT from getting any brightness signal during a vertical failure. This prevents a permanent CRT phosphor line burn.

In the circuitry, this is accomplished by grounding the DC voltage that outputs at Jungle chip IC351/pin 31, using transistor Q561. The Jungle IC then stops all signal from the RGB output pins.

Q562 monitors the flyback (FB) signal used to make the boost voltage at vertical output IC561/pin 3. This 28Vp-p signal is present when the IC is working. It is coupled into the base of Q562 and output at the collector to keep capacitor C563 discharged, so there is 0V across it as long as vertical flyback/boost pulses are present.

The 0V is applied to the base of the next transistor, Q561, keeping it off. Therefore, this transistor is effectively out of the circuit when vertical output stage operates normally. During a failure of either the protection circuit or the output IC's flyback generation stage, Q561 grounds out the DC voltage stopping BOTH positive and negative drive signals from IC351/pins 31 and 32. However, vertical signals are still present at pins 30, 33 and 35, proving the Jungle IC's vertical osc is still working.



BLANKING 1/VERTICAL DEFLECTION

CTV24J5 S28 2 25 97

Troubleshooting

Symptoms

If the TV has high voltage at turn ON, yet the screen remains dark while the front panel TIMER light blinks, the TV picture is blanked.

What to Do:

The first course of action is to turn up the screen control while observing the picture tube screen.

No Brightness:

If there is no brightness at all, then a loss of heater voltage, B+, screen voltage, bad CRT socket, or low or no high voltage would be the most logical causes of that problem.

Uniform Brightness:

If there is brightness on the CRT when the screen control is turned up, it proves the Jungle chip IC351 is blanking the picture or there is no video input present. If the brightness is uniform, there is either an IK line loss of data or no video. If the brightness appears either at the top, bottom, or middle of the screen, there is a loss of vertical deflection or drive signal.

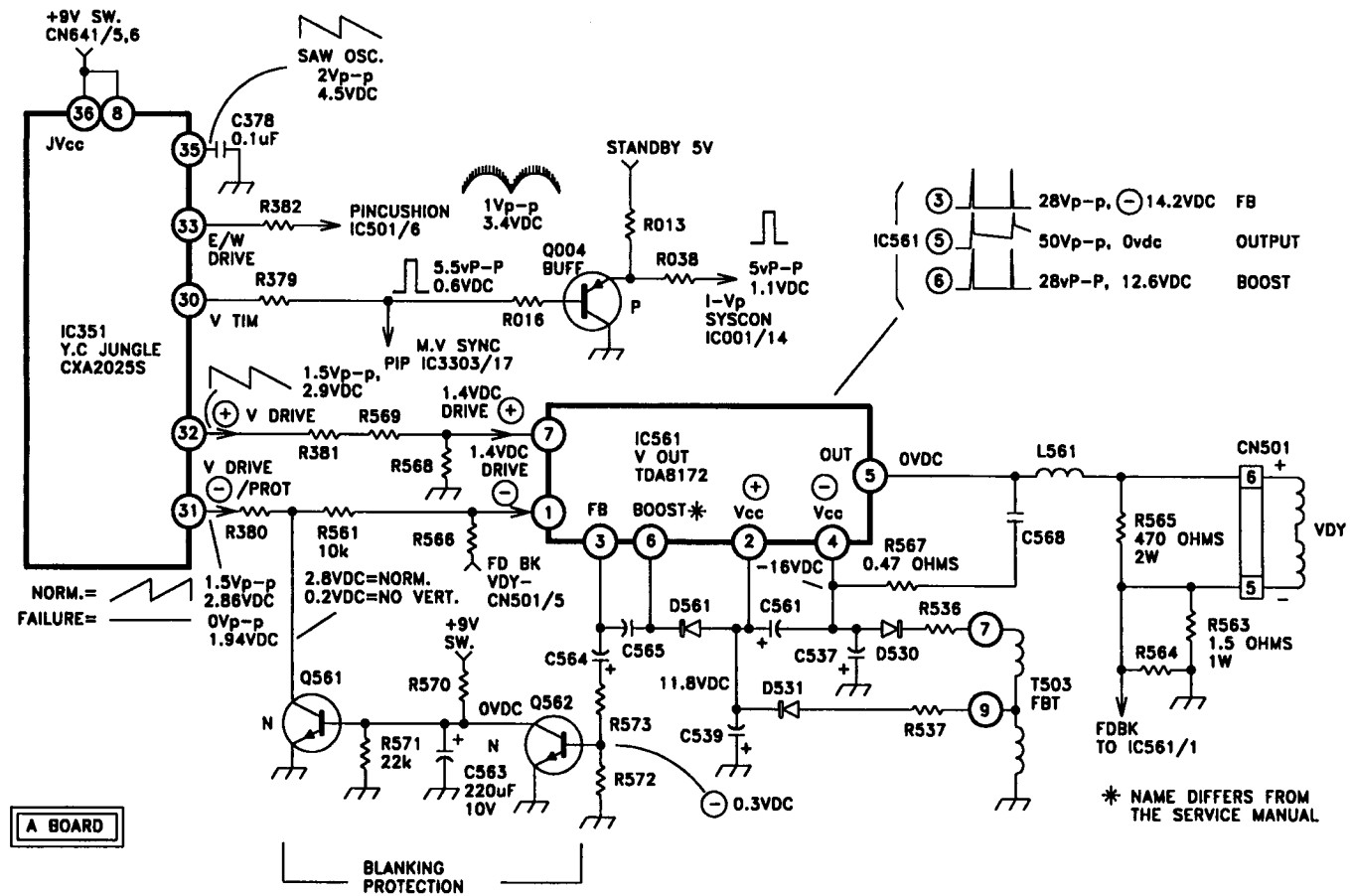
Bright Line:

With the visual on-screen proof of a vertical failure, a DC voltmeter on Jungle IC351/pin 31 will determine if the problem is in the vertical output stage or within the Jungle IC itself. An abnormal 2.0Vdc at pin 31 or 0V at Q561/Collector indicates the vertical output IC561 is not functioning. However a normal voltage of 2.9Vdc at pin 31 indicates that the problem is within the Jungle IC or not in this section at all. A scope placed at Jungle IC351/pin 31 or 32, will prove if the Jungle chip is outputting vertical pulses to the deflection yoke. If there is a deflection signal, blanking is caused elsewhere.

Normally on Sony TVs, the front panel Timer light blinks after being powered ON for about 8 seconds at 1 blink per second. At the end of 8 seconds, the raster appears on the screen (or the word "video"). When a failure prevents the TV from finishing the start up sequence, the timer light will continue to blink.

Blinking Front Panel Timer Light		
Circuit Failure	Is the front panel Timer Light continuously blinking?	
	Yes	No
1. Simulate Vertical failure (ground Jungle IC351/pin 31)	X	
2. Simulate IK circuit failure (turn down screen control)	X	
3. HV shutdown (ground IC351/pin 38)	X	
4. No HV (H Out - b-e shorted)	X	
5. No data/clock to/from Jungle IC351 (Removed R355, R356 separately)		X never blinks
6. No serial data to from Micon/Syscon IC001 (lifted R073, R075)		X never blinks
7. No Y input		X

In summary, the blinking light is a busy signal from the Jungle IC351 to Micon/Syscon IC001. The Jungle IC sends out a busy signal to Micon/Syscon while looking for the completion of its start up checks at these 3 sections: Vertical flyback pulses, Horizontal AFC feedback pulses, and IK pulses. If the Jungle IC is not connected or does not send out a busy command, the front panel Timer light never blinks. Normally at start up (turn ON), the timer light continues to blink because the IK circuitry in the Jungle IC needs the picture tube to warm up before the Jungle IC outputs a no longer busy command.



BLANKING 1/VERTICAL DEFLECTION

CTV24J5 528 2 25 97

BLANKING 2 / SERIAL DATA

Overview

Once the unit is turned ON, high voltage appears, but the screen remains dark until these conditions are met in order:

1. Vertical deflection signal must be present,
2. Serial data & clock signal is transferred between Syscon/Micon & Jungle IC;
3. Picture tube's IK white balance return signal is present and within balancing range and
4. There must be video input to the Jungle IC (dark screen like blanking).

The serial data path and the video inputs to the Jungle chip are shown in this blanking 2 diagram.

Serial Data

Serial data into the Jungle chip IC351/pins 9 and 10 comes from syscon/micon IC001/pins 53 and 55. This data line is a bi-directional signal but the clock pulses are unidirectional output from IC001 to the Jungle IC, the P in P processor, and the AV switching IC at the rear panel (not shown).

Serial data and clock output IC001 only during the vertical interval time when there is no picture. This is to prevent the fast rise and fall of these digital signals from radiating interference to the TV picture.

Therefore, in order for IC001 to output data, it must have vertical timing pulses. Without vertical timing pulses, the data outputs sporadically. Vertical timing pulses come from the Jungle IC351/ pin 30 when power is turned ON and 9V is applied to it. These vertical timing pulses pass buffer Q004 into micon IC001/pin 14. Of course, Syscon/Micon IC001 still needs:

1. HIGH at pin 15 to mark the end of reset and
2. clock signal at pin 17 and 18 for it to operate.

Video Input

Although a dark screen can be caused by blanking from a loss of vertical, loss of serial data or a failure in the IK white balance circuitry, no brightness can also be caused by the absence of a video signal. The main video input comes in as Y & C from Jungle IC351/pin 6 and 7 and outputs as RGB output at pin 22, 24, & 26.

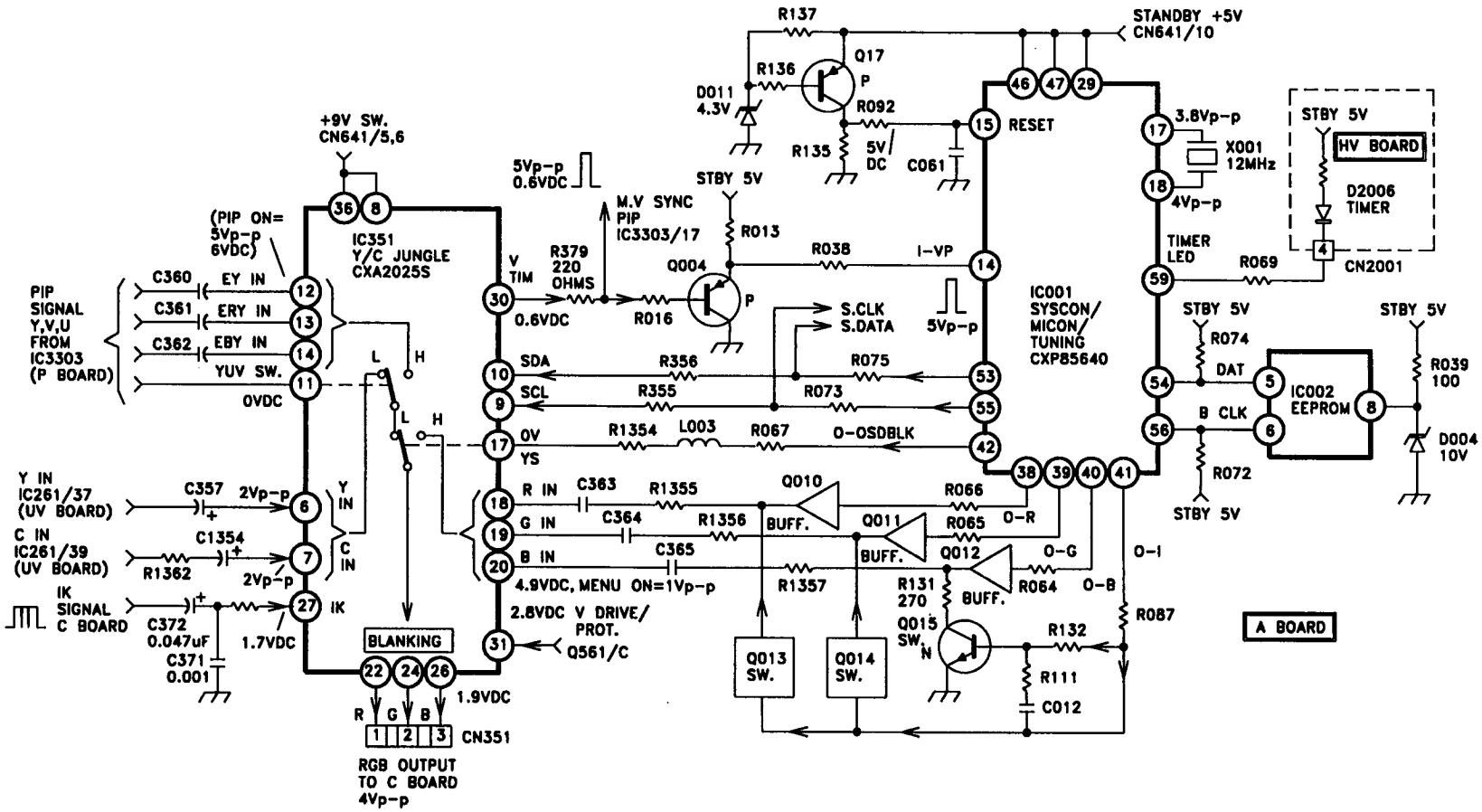
The main video path is interrupted by the Picture in Picture signal. The Picture in Picture signal inputs the Jungle IC351/pins 12-14 as Y, R-Y, and B-Y. A "YUV" signal at pin 11 selects between the main picture (LOW) and the small sub picture (HIGH).

Closed Caption & On Screen Display

At the Jungle IC is another input to this video path. The closed caption and on-screen display text information comes from syscon/micon IC001/pin 38 - 40. These small narrow width OSD text pulses are buffered and enter the Jungle IC351/pins 18, 19 and 20. They are difficult to see on a scope.

The black closed caption background begins when IC001/pin 42 (OSDblk) goes HIGH. Then the text is inserted at the right time with the text pins 38-40 and pin 42 returns LOW to end the caption box. The I (intensity) output from IC001/pin 41 can be used with the RGB text output signal to bring any of these lines to ½ the voltage (when Q13-15 conduct). This permits 16 text colors to be output instead of 8.

Since the video signal that passes through the Jungle chip can be interrupted, a dark screen can occur as if picture blanking. Therefore expect IC351/pin 17 to have 0Vdc during normal operation. The YUV input at IV351/pin 11 can also have the same symptom (dark screen). This input comes from the PIP stage and should normally be 0Vdc as well.



UNBLANKING 2/SERIAL DATA

CTV24J6 529 3 3 97

Troubleshooting

After high voltage is proven present, press the remote's DISPLAY button to see if there is on screen display (OSD). An OSD means the dark screen is caused by no video. Now it is a matter of using the scope to follow the video path (simplified video path diagram from the tuner/video input to the CRT in this book).

When there isn't even an OSD, then the screen is blanked. Turn up the screen control and observe the TV screen. No screen brightness means a loss of filament or screen control voltage. A screen brightness means blanking has occurred because of no serial data, vertical failure, or IK circuit failure.

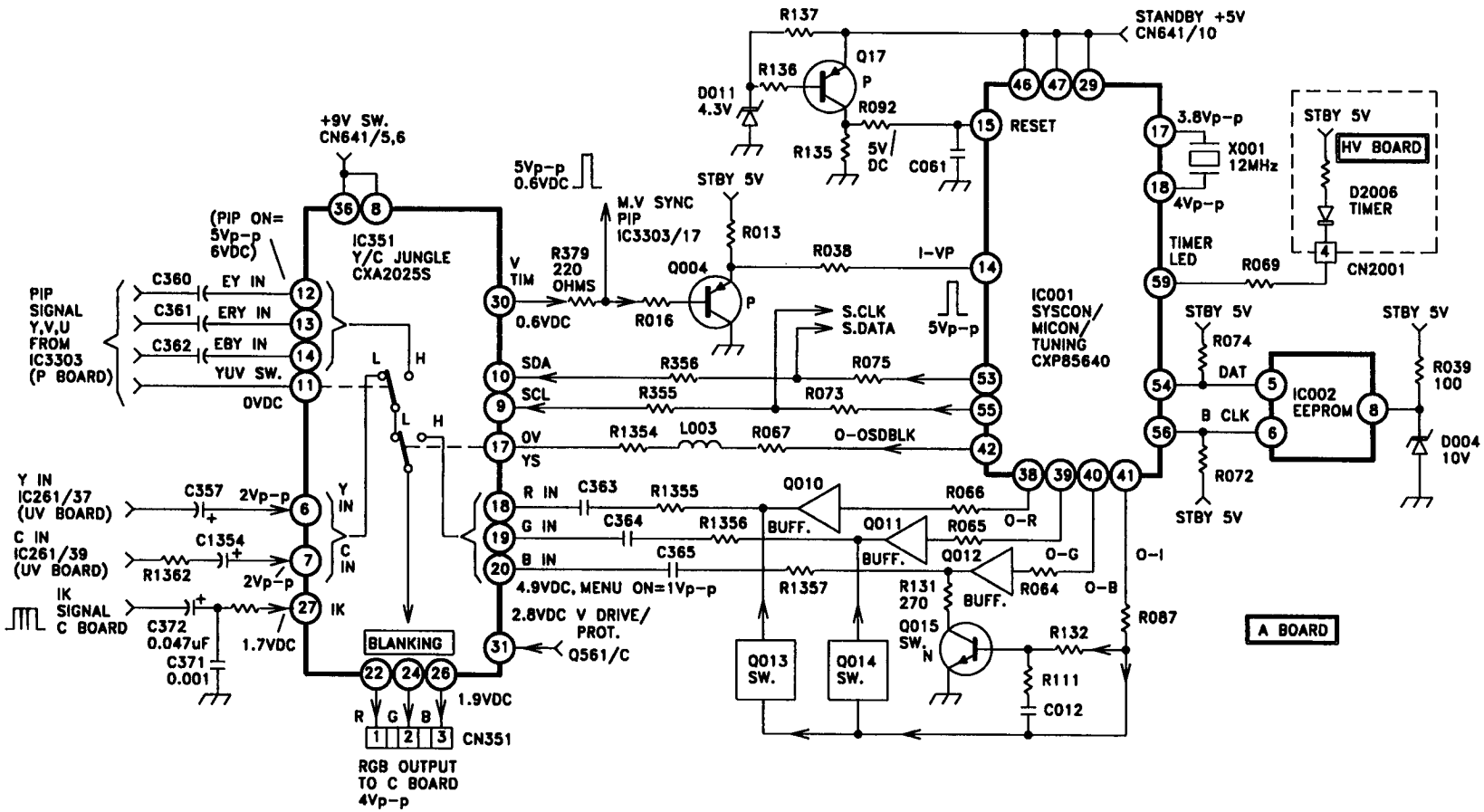
The presence of serial data can be checked at the unshielded Jungle IC351/pins 9 and 10. The IK signal can be checked easily at the C Board (not shown) at a plug marked IK. If all three IK pulses are there, the IK circuitry is working.

The timer light on the front panel will tell you if there is a video loss (blinks for about 8 times and stops) or if there is blanking (continuous blinking). At turn ON, system controls send out data to the various ICs on the data line to identify which ICs are present. Some IC's return information, like the Jungle IC351. The Jungle IC will return a "busy" signal because it is checking all its other inputs or functions. These functions include the vertical, IK, and the high voltage stage. The IK stage takes longest to check because the picture tube has warmed up. Then the Jungle IC returns an OK signal on the data line to the system controls microprocessor and the timer light stops blinking (no longer busy). At that time IC001 releases the degaussing coil relay (normally about 8 seconds from turn ON of the TV). The chart below shows what failures would cause the timer light to continue blinking.

Normally on Sony TVs, the front panel Timer light blinks after being powered ON for about 8 seconds at 1 blink per second. At the end of about 8 seconds, the raster appears on the screen (or the word "video"). When a failure occurs, the light may continue to blink.

Blinking Front Panel Timer Light		
Circuit Failure	Is the front panel Timer Light continuously blinking?	
	Yes	No
1. Simulate Vertical failure (ground Jungle IC351/pin 31)	X	
2. Simulate IK circuit failure (turn down screen control)	X	
3. HV shutdown (ground IC351/pin 38)	X	
4. No HV (H Out - b-e shorted)	X	
5. No data/clock to/from Jungle IC351 (Removed R355, R356 separately)		X never blinks
6. No serial data to from Micon/Syscon IC001 (lifted R073, R075)		X never blinks
7. No Y input		X

In summary, the blinking light is a busy signal from the Jungle IC351 to Micon/Syscon IC001. The Jungle IC sends out a busy signal to Micon/Syscon while looking for the completion of its start up checks at these 3 sections: Vertical flyback pulses, Horizontal AFC feedback pulses, and IK pulses. If the Jungle IC is not connected or does not send out a busy command, the front panel Timer light never blinks. Normally at start up (turn ON), the timer light continues to blink because the IK circuitry in the Jungle IC needs the picture tube to warm up before the Jungle IC outputs a no longer busy command.



UNBLANKING 2/SERIAL DATA

CTV24J6 529 3 3 97

BLANKING 3 / IK White Balance

Overview

The IK white balance circuit adjusts the gain of the RGB video signals that output the Jungle chip. Actually the Jungle IC351 outputs two independent signals at the RGB output terminals. One is the IK signals and the second is the RGB video signal. Three conditions must be met before outputs occur:

1. The vertical must be operational (2.8Vdc at IC351/pin 31).
2. Serial data must be present (IC351/pins 9 and10. 5Vp-p).
3. IK pulses must be input and within a usable range (IC351/pin 27).

The first two conditions, vertical and serial data, can be easily checked since they appear as soon as the set is powered ON (when 9V is applied to the Jungle chip IC351/pins 8 and 36). The IK signals can then output the Jungle IC. After the picture tube warms up, the IK signal is altered and returned to the Jungle IC. This IK return signal is used for white balance but takes approximately eight to ten seconds because of the picture tube warm up time. When the IK signals return to the Jungle IC, RGB video signals can output (no longer blanked).

IK Electronic White Balance

When the serial data and vertical drive are present, the IK circuitry can begin operation. Electronic white balance is achieved by outputting three pulses, one at each RGB output line, to the CRT cathodes. IC351/pins 22, 24, and 26 output a very large 4Vp-p CRT drive spike during the vertical interval.

CRT Drive

This signal can be followed to the cathode of the CRT. This drives the cathodes full ON one at a time for a single horizontal line each within the vertical blanking area (above the picture). These three signals are sampled at the cathodes of the CRT by buffers Q1763, Q1773, and Q1783 and combined into 3 pulses. The amount of current drawn by each cathode is represented by these pulses.

RGB Balance and Unblanking

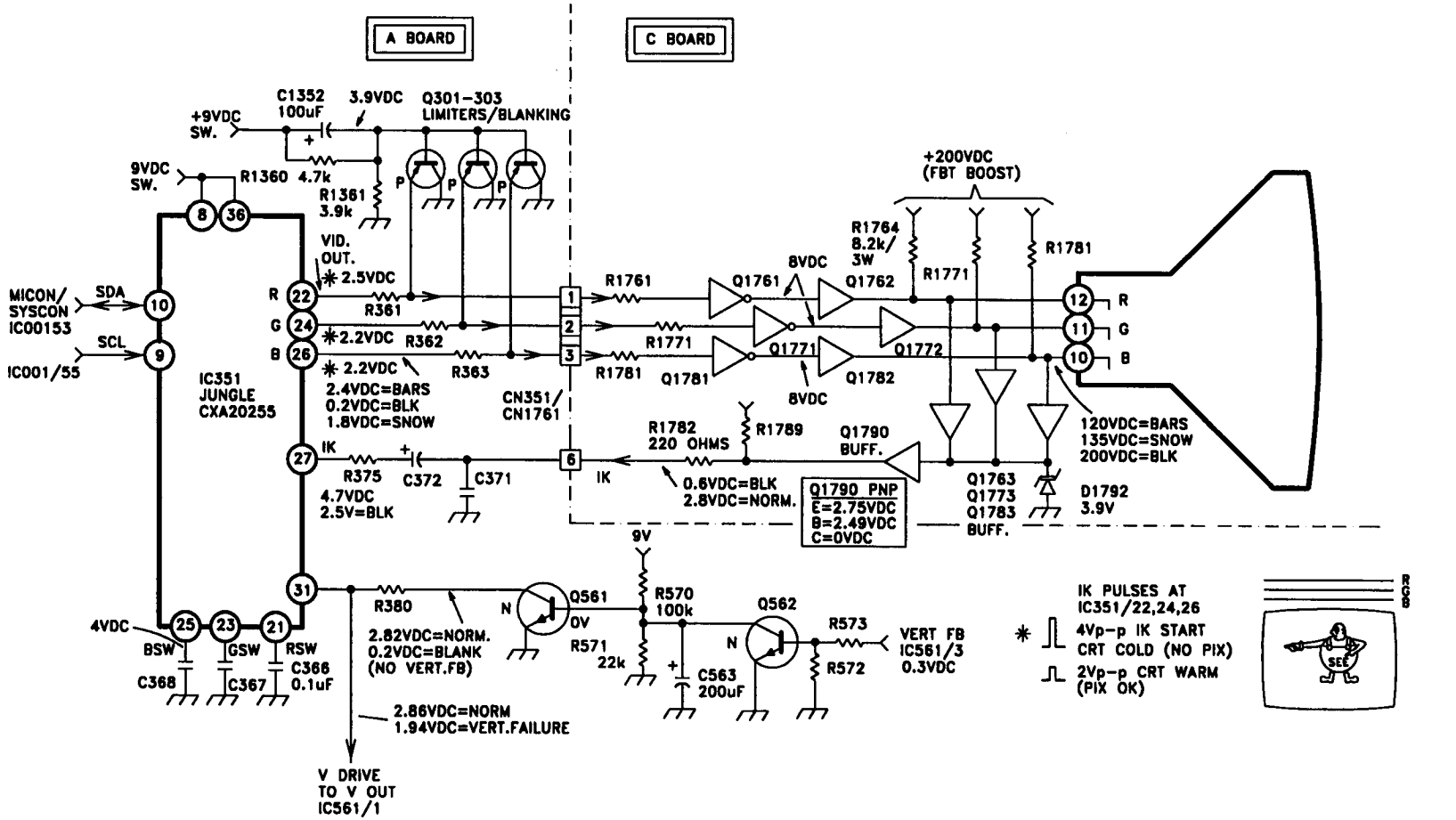
The Jungle chip receives the IK signal as 3 pulses at IC351/pin 27. Internally these three pulses are applied to capacitors C366, C367 and C368. Each capacitor represents a DC voltage proportional to the efficiency of that cathode. It is this voltage that is used to control the gain of the individual RGB amplifiers within the Jungle IC to achieve white balance. If the voltages are within a normal range of approximately 2 to 7Vdc, then the Jungle chip can white balance and will permit RGB to output IC351/pin 22, 24 and 26. Therefore, the white balance circuit works before the picture actually appears on the screen and continuous to work as long as the set is on.

Timer Light Stops Blinking

At the completion of the white balance operation, serial data information is returned to the system control's IC001, telling it that the Jungle IC351 is no longer busy and has satisfied all the conditions for unblanking. The control IC001 then stops the front panel TIMER light from blinking and de-energizes the degaussing coil relay. This completes the start up operation.

Spot Elimination Circuit/Limiter Circuit

Q301-Q303 are PNP transistors that have 2 purposes. During normal TV operation the base of these 3 transistors are held at 4 Vdc by the R1360 and R1361 voltage divider. Therefore voltages higher than 4Vdc at Q301-Q303 emitters from the CRT will forward bias these transistors but voltages under 4 Volts will be unaffected. If a spike from the CRT appears here, these limiter transistors will protect the Jungle IC from arcing.



BLANKING 3/IK WHITE BALANCE

When the set is turned OFF, Q301-Q303's base will drop toward 0Vdc via R1360 (+9Vdc is now ground). Any CRT drive voltages from the Jungle IC351 R, G, B outputs will forward bias the base-emitter junctions of Q301-Q303 and this voltage will be grounded out to make sure the screen is dark at turn OFF.

Troubleshooting

If there is no OSD and you turn the G2 Screen control up to find there is brightness (not a single line), blanking is caused by a loss of data/clock or a loss of IK signal. Checking the data was explained in the previous blanking 2 section. The IK white balance circuit can be **checked** or **bypassed** to find out if this stage is causing the dark screen. Each method has limitations:

Checking Methods

A. Three pulses must return from the CRT © board on the IK line. They are easy to count with a scope. If they are present, then signal is being input to the Jungle IC and the problem is most likely at or about the Jungle IC351. If they are missing, the Jungle IC may not be outputting these pulses, or the CRT's filament is not lit. One missing pulse can be traced through the CRT board. The pulses are R, G, B in that order.

B. Check the three individual CRT drive signals output from IC351/pin22, 24 and 26. These normally should be 4V peak to peak when the set is first turned ON. When the picture tube is warmed up and IK signals are returned to the Jungle chip, these 4Vp-p output signals should drop down to 2V p-p.

   If one remains HIGH at 4V peak to peak, that signal is not being returned. Therefore either an IK pulse is not originating from the Jungle IC351/pins 22, 24, or 26, or they are not being returned at IK pin 27.

   Voltage limiter transistors Q301-3 protect Jungle IC351 from arcing CRT voltages that would damage it. These transistors are biased with voltage divider resistors R1360 & R1361 at the base so any voltage over 4V will turn on the transistors and ground out the damaging voltage. If any one shorts because it sustained a large voltage spike, the IK pulses will not output and blanking will be the symptom.

   In a different area, if one IK output is HIGH (4Vp-p) yet there are 3 pulses returned on the IK line (pin 27), don't forget to check the filter capacitors at pins 21, 23 and 25 for opens or shorts.

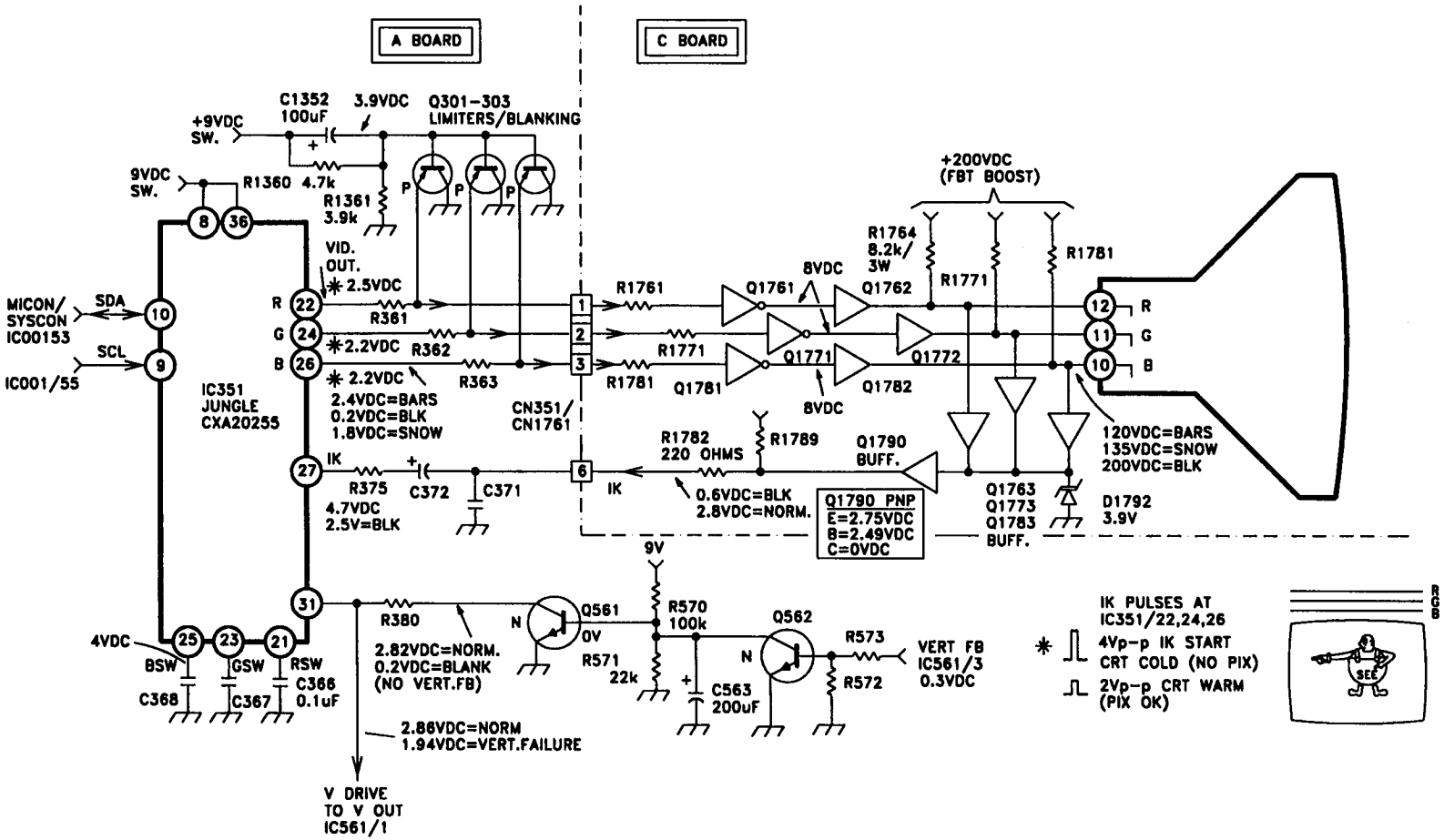
C. The DC voltage at the IC351/pins 21, 23 and 25 sample & hold IK capacitors should be between 2 to 8Vdc representing normal operation. If one of these voltages is too LOW, (typ = 4Vdc) suspect leakage or an open in that capacitor or that IK pulse is missing. There is also a small unimportant residual 0.1Vp-p horizontal waveform normally present at these pins.

Bypass Methods

A. Apply 4.7Vdc (with a diode in series for protection) from an external power supply to the IK pin at Jungle IC351/pin 27. This will cause the picture to unblank and you should see which color is missing.

B. At the C board, connect pins 1, 2, 3 and 6 together. This returns all of the IK pulses back into the IK line, bypassing the CRT circuitry on the C board. If a picture appears, then there is a proven problem on the C board. With these pins soldered together you should get only a black & white picture on a normal TV. However, you will see that one of the colors is clearly missing if there is an IK problem.

C. In previous Sony sets, you could momentarily unblank the IK circuitry by connecting a 1K ohm resistor between the 9V line and pin 6, the IK input. This does NOT seem to work on this particular AA-2chassis, but it does work on all the previous Sony TV sets.



BLANKING 3/IK WHITE BALANCE

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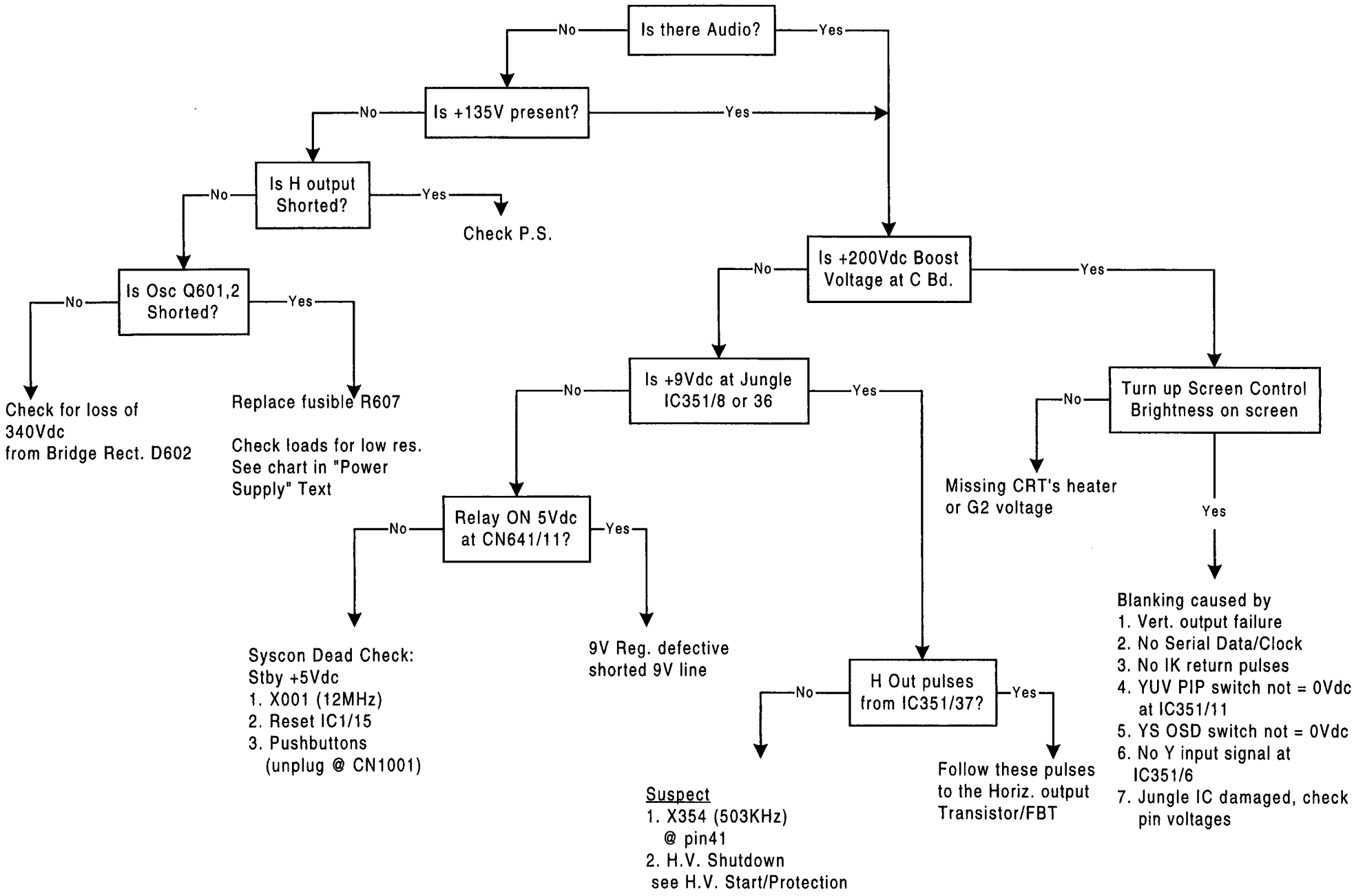
NOTES

DARK SCREEN FLOW CHART



VIDEO PROCESSING

Tuner

The tuner requires several inputs to operate:

1) +5V (Derived from the switched +9Vdc)
2) +9V Sw for basic operation
3) +30V for tuning voltage (Derived from 135Vdc B+).
4) Data and clock inputs from microprocessor IC001/pins 10 and 11 are positive-going pulses. They are present when the TV set is ON, whether you're in video input or TV operation.
5) The Enable or latch signals from syscon/micon IC001/pin 4 are also present when the set is ON.

Tuner Operation

When the channel up or channel down button is pressed, systems control's microprocessor IC001 receives this command and changes the data output IC001/pin 10. This data tells the main tuner TU102 to tune to the desired station. At the same time, an AGC mute HIGH is output at system control's IC001/pin 1. This is used to momentarily ground out the AGC section within the tuner, permitting it to drop down to minimum gain so the tuner's AFC doesn't hold onto the current station in the process of changing stations. Therefore, the voltage at the tuner's AGC terminal remains at approximately 4 to 5V when switching from station to station instead of going to 7 or 8V which represents the highest gain when there is snow present. This pulse lasts only about one second. A defect in this stage, although rare, would cause weak reception or it would take a little longer to tune to the next station when using channel up/down.

Station ID

Once switched to the new station, the station's center frequency is identified using the AFT signal that enters system control's IC001/pin 22 from the tuner (2Vdc = station center). Syscon uses this voltage to identify the center frequency of a station, but since this AFT section can be fooled, the location of the station is also identified with the station video's horizontal sync pulses that enter IC001/pin 8. During automatic scan and channel change, a station is identified, using AFT and horizontal sync.

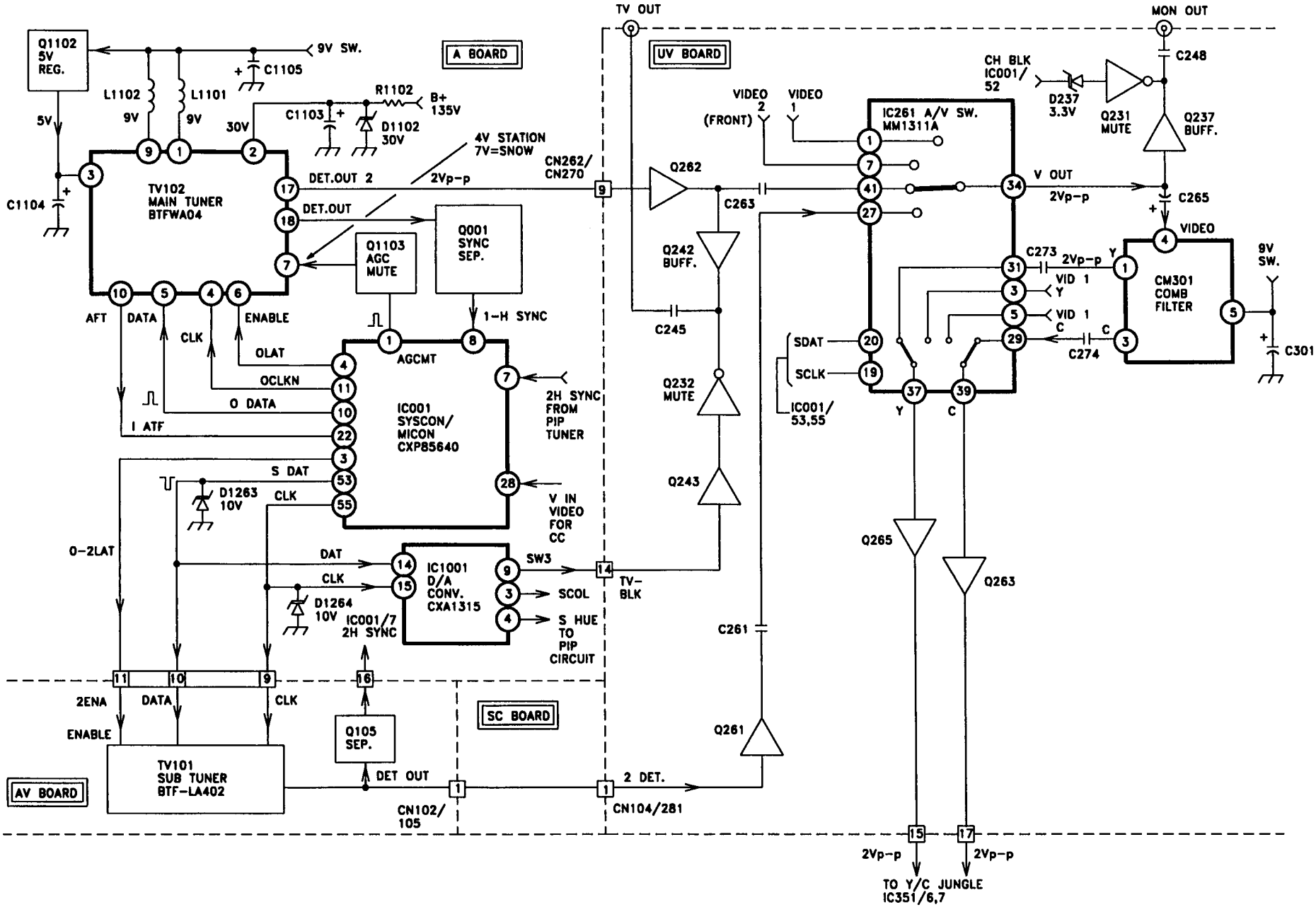
Sub Tuner

The sub tuner works in the same manner; however for simplification purposes in the diagram, the remaining lines, such as the AFT and horizontal sync, are not shown. Note that the sub tuner is controlled from the same data line (IC001/pins 53) used to communicate with other ICs. This means the sub tuner responds slightly slower than the main tuner, which utilizes a dedicated communications port. This 5Vp-p data line is limited by a 10Volt zener diode D1263 so a high positive voltage spike, will not damage microprocessors on this serial data line. The 10V zener diode D1263 should not effect the normal 5Vp-p signals on this data line.

Signal Flow

The signal output from the main tuner TU102 is a composite video signal that leaves the detector out terminal. It is applied through buffer Q262 to the A/V switch IC261/pin 41. Pin 41 is one of several inputs to the A/V switch. The other inputs (three video inputs and the sub tuner) can also be selected to output at of IC261/pin 34. This switch also swaps (changes places) between the main picture and the sub tuner.

From the tuner, a 2Vp-p composite video signal enters IC261/pin 41 and when selected by the user, exits at pin 34. This video signal enters the comb filter CM301/pin 4 and exits as luminance at pin 1, and chroma at pin 3. Be aware that when checked by a scope, the 2Vp-p chroma not only contains the chroma, but also low frequency luminance which is removed later. The luminance and chroma signal re-enter the A/V switch IC261/pins 31 & 29 to be selected again. Either this tuner video signal or the rear panel luminance and chroma input (S Video) from the (pins 3 & 5), can be selected and output from IC261/pins 37(Y) & 39(C) (2Vp-p). These signals are applied to the Jungle IC351/pins 6 & 7, as the main picture signal.



VIDEO PROCESSING

CTV24J7 533 3 4 97

PICTURE IN PICTURE PROCESSING

Overview

The purpose of the Picture in Picture circuitry on the small P board is to digitally compress the normal 525 line transmitted picture into a smaller picture. To do this, the PIP processor IC must first take the analog luminance and color information, and convert it to digital format. Then, using the vertical and sync pulses, this IC eliminates lines of information, making the picture smaller. The remaining information is then stored into memory. When PIP is called for by the customer, the memory's picture is then output with a box surrounding this child picture. It is converted from digital back to analog before leaving this PIP processor IC3303 as Y, R-Y, and B-Y.

Through technology, most of this child picture processing is being done in one IC3303, which makes troubleshooting simpler. The other main IC is a chroma decoder, IC3301 that converts the incoming "sub V" tuner video into Y, R-Y, and B-Y for the PIP processor IC3303. The color level and hue of this child picture information is adjusted by IC3301 so it matches that of the main picture.

The Picture in Picture circuit board needs the following signals to operate. These signals are present all the time, when the set is ON, whether the Picture in Picture section is being turned on or not. These signals are:

1) Serial data and clock signal at connector CN3001/pins 19 and 20.
2) +9V at CN3001/pin 8, which becomes +5Vdc on the board.
3) Input video signal at CN3001/pin 5 = 2Vp-p.
4) The TV set's vertical and horizontal pulses to determine where the beam is at any given moment, so the Picture in Picture can be stored in the right place in memory and output for main picture insertion at the right location. These input timing signals are approximately 6Vp-p.
5) There must be 0V at the channel blanking input at CN3001/pin 18 to avoid muting the incoming child picture video information. (Symptom = PIP box but no child picture.)

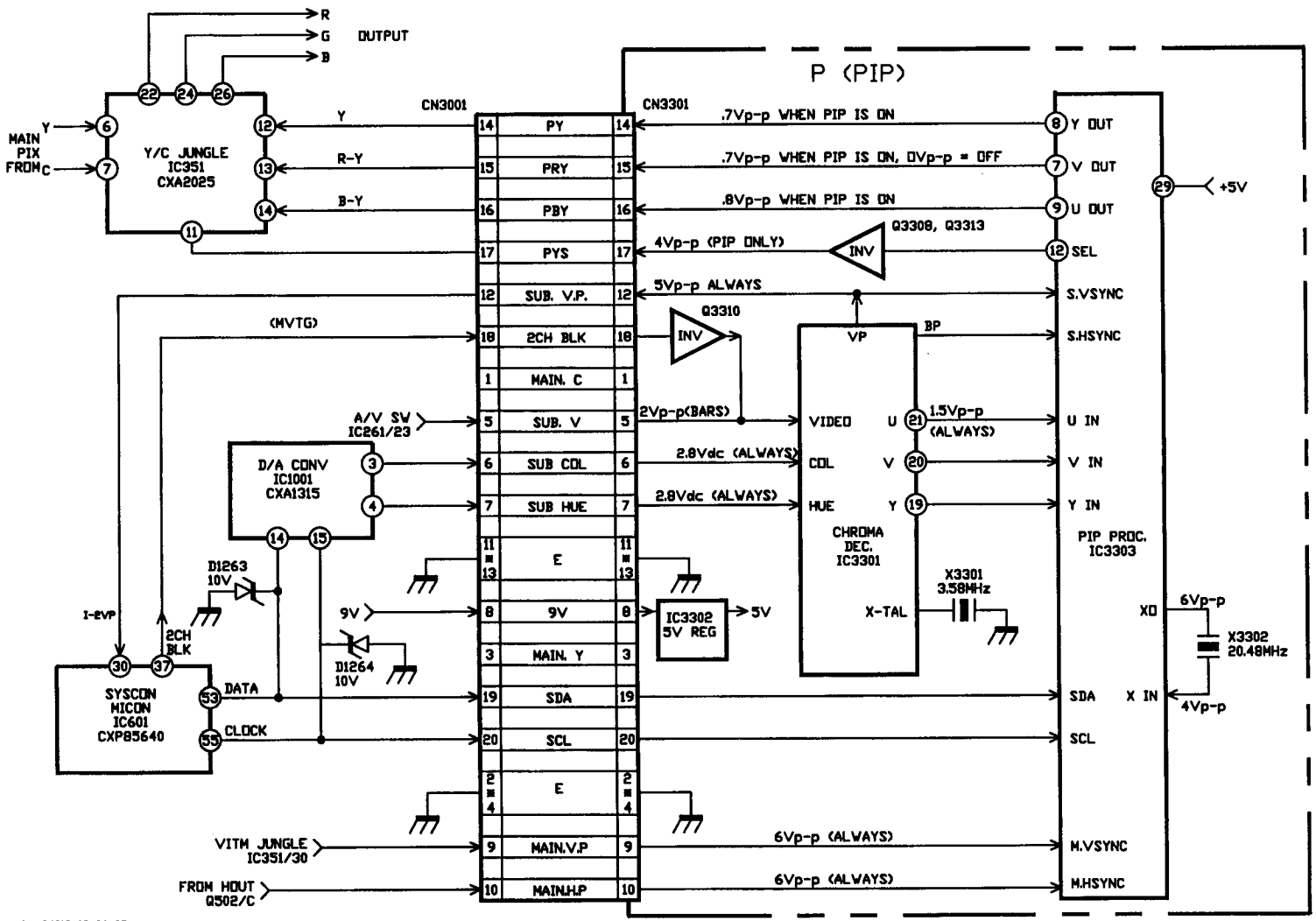
When PIP is turned on, the Y, R-Y, and B-Y signals output the P board and are switched into the main picture at the right time. That is the purpose of the YUV (or PYS) switching signal that is output at pin 17, when the child picture is output. This signal YUV to Jungle IC341/pin 11 selects the main picture when LOW and the Picture in Picture when HIGH. Therefore, when Picture in Picture is called for from the remote control, all four Picture in Picture inputs to the Jungle IC351/pins 11, 12, 13 and 14 will be active.

Signal Flow

The sub V or child picture that enters the Picture in Picture board is a 2Vp-p video signal that is input to the chroma decoder IC3301. IC3301 outputs the video as Y, R-Y and B-Y labeled as Y, V, & U at IC3301/pins 19, 20 and 21. (The simpler labeling of Y, V, & U in place of Y, R-Y and B-Y has been used in Europe for years now.)

The 2.8Vdc at CN3001/pins 6 & 7, is fed to the chroma decoder IC3301 and used for determining the color and hue of the child picture. The source of this color control voltage is serial data from Syscon/Micon IC001/pins 53 and 55. The D/A converter receives this data at turn ON and outputs a constant 2.8Vdc at IC1001/pins 14 and 15, as long as the set is turned ON.

The Picture in Picture processor IC3303 outputs child picture information wherein serial data (SDA, SCL) is input and calls for that feature. At that time, only when PIP is turned ON does the child picture information output from IC3303's Y, V, and U output terminals.



PICTURE IN PICTURE

LIGHT SENSOR CIRCUIT

Overview

Sony has an automatic room light monitoring feature that is built into most of the models of the AA-2 chassis with a "V" in the middle of the model number, such as KV27V35. This feature is called the light sensor.

This feature is turned ON/OFF from the video menu. Once turned ON, the customer's manual picture control range is reduced slightly and this automatic circuit has greater contrast and color (picture) control.

The purpose of this circuit is to monitor ambient room light with a sensor at the TV's front panel (usually next to the IR receiver) and adjust the picture (contrast and color) level accordingly. For example, if the room light is darkened, the light sensor circuit will decrease the TV's picture level so it will not appear so bright.

This circuit is slow to respond, preventing rapid changes in room light or its own picture scene changes from causing picture flickering or fluttering. These delays are designed into the IC2004 sensor and an external 100mfd damping capacitor C2236, which is used to slow response time.

Circuit Description

The light sensor circuit pictured below is always monitoring room light and outputting a corresponding DC voltage into the Syscon/Micron IC001/pin 19 for picture level adjustment. Lumisponder IC2004/pin 2 output voltage is reduced as the room becomes darker. The output voltage is applied to two buffer transistors, Q2009 and Q2008. This control voltage is input to Q2009/base and output Q2008/emitter. The DC voltage is applied to the main microprocessor IC001/pin 19. When this circuit is turned ON, serial data output Syscon/Micorn IC001/pin 53 and instructs the jungle IC351 to adjust the picture level accordingly.

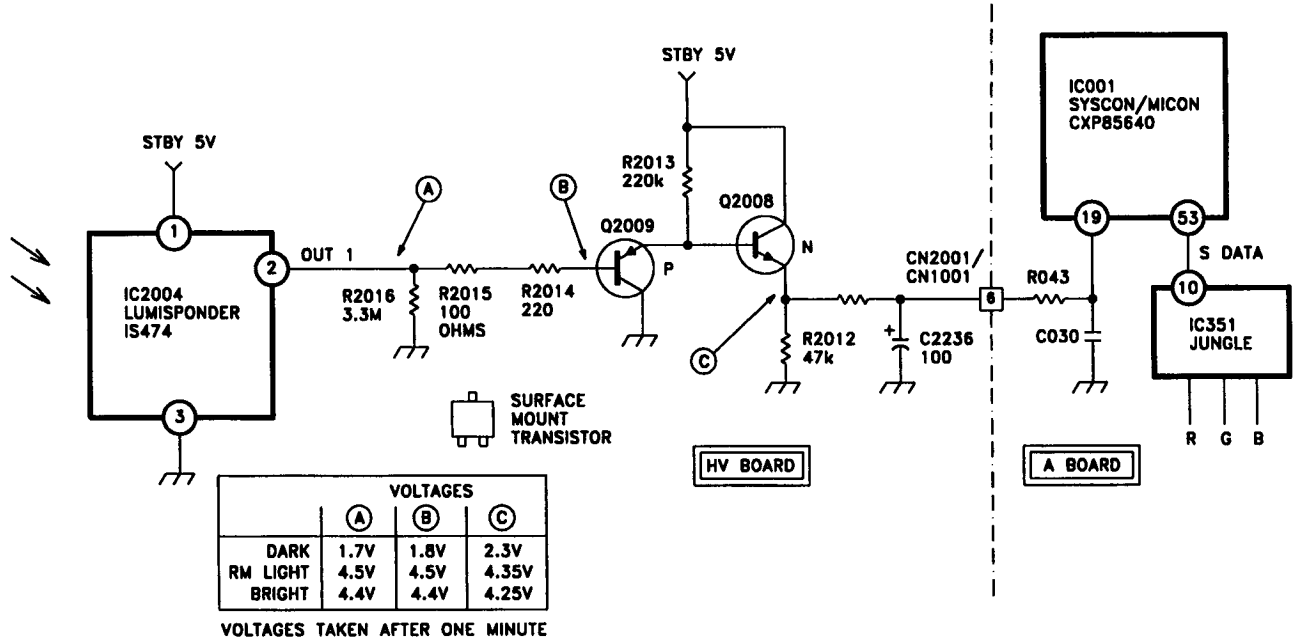
Troubleshooting

Common complaints about the light sensor circuitry are:
Picture gets too bright when the light sensor circuit is switched ON
Picture gets too dark when the light sensor circuit is switched ON
Picture gets bright and stays bright when the light sensor circuit is ON.

The first two complaints may just be due to window light striking the front of the TV in a darkened room or having an object in front of the TV blocking room light to the light sensor. Repositioning the TV or object should resolve these problems.

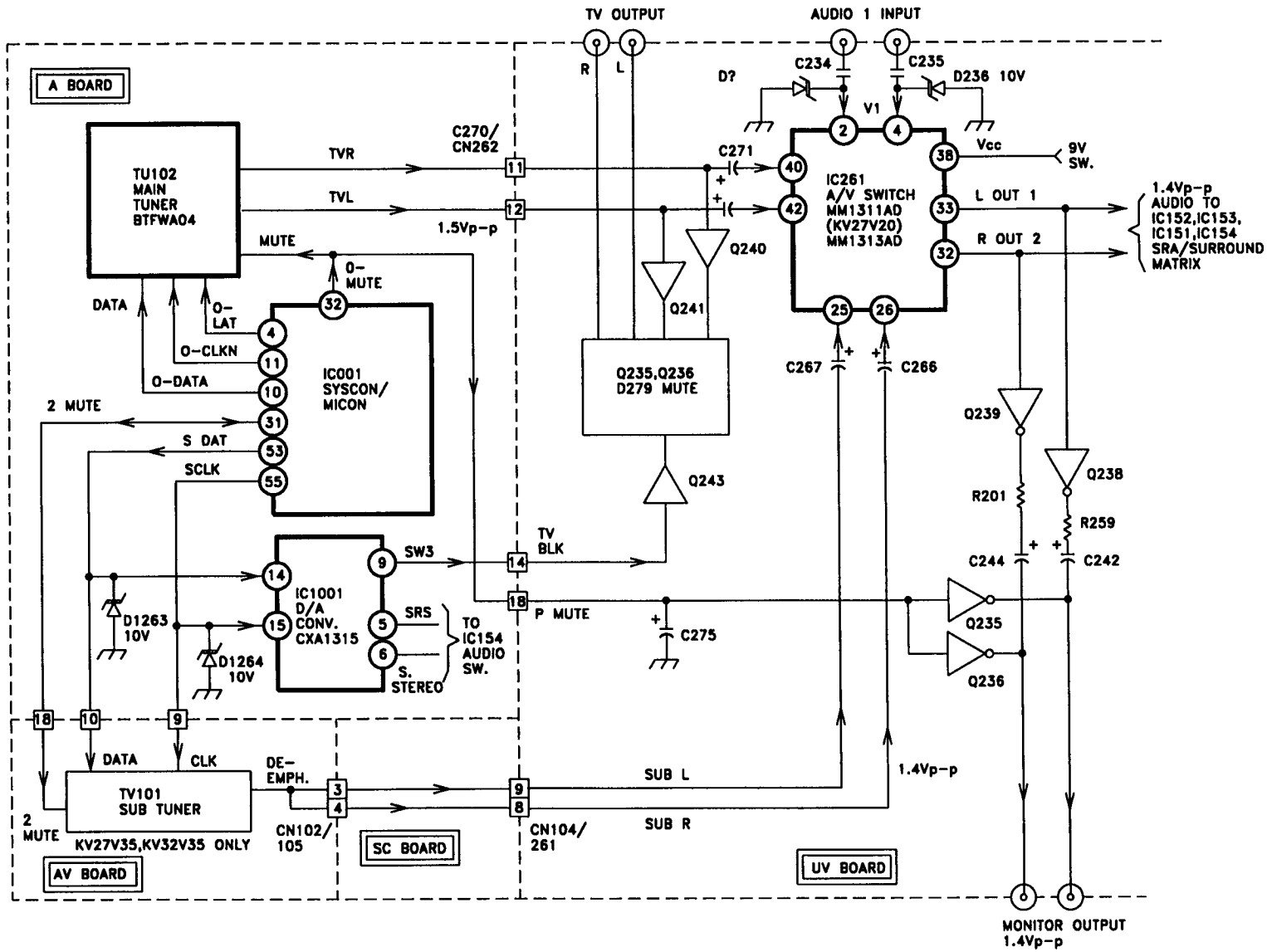
Testing
If there is no change in picture level as a flashlight is shined in the sensor or light is blocked from the sensor, the circuit is not working.

DC voltages should change in the DC circuit path as you put your thumb over the sensor. The response will be immediately seen on a DVM but gradually continue to change, taking up to almost 2 mins for the DC voltage to become stable.



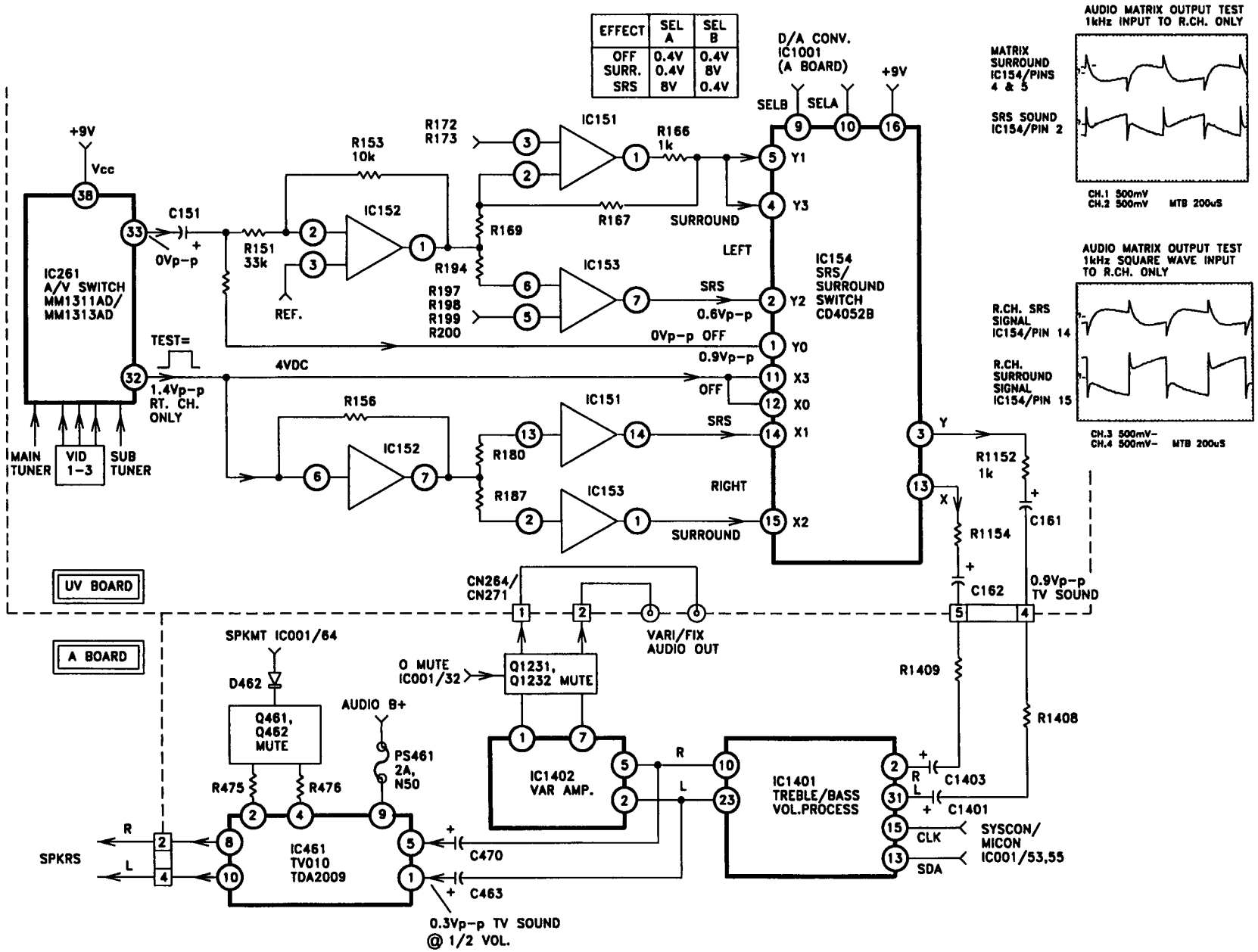
LIGHT SENSOR CIRCUIT

CTV24J17 550 3 20 97



AUDIO PROCESSING

CTV24J12 540 3 6 97



AUDIO OUTPUT

CTV24J11 539 3 6 97

POWER ON - BA-3 CHASSIS

Overview

Just as in the AA-2 chassis, the BA-3 chassis has a power supply that is active as soon as the set is plugged in. Its oscillator always runs and outputs +115V B+ and +12Vdc. When the TV set is turned ON, 9V is applied to the Jungle chip, which generates vertical and horizontal drive signals. The horizontal drive is applied to the flyback, which develops scan-derived ±15V for the TV circuits and high voltages for the picture tube.

Plug In

When the set is plugged in, the power supply oscillator (Q602 and Q603) begins working with the aid of feedback transformer T604. The main power transformer has secondaries which develop 115V B+ and +12V. The +115 B+ is applied to the 115V B+ error regulating stage consisting of T604 & IC601. The regulated 115V B+ supply is used by the horizontal stage. The 12Vdc is used by the 115V B+ error regulating stage (T604 & IC601) and becomes standby 5Vdc after regulator IC693. This 12Vdc is also applied to a 9V regulator transistor Q606, that is only active when the set is turned ON.

At plug in, to prevent the 115V B+ from initially rising too high and causing a shutdown condition, Q610 is used to keep this voltage LOW. The circuit works this way: When the 12V line begins to rise, it is also applied to the emitter of Q610. Current flows through R620, Q610's emitter-base junction, and C633 to ground, until C633 charges. This current path turns Q610 ON, permitting a positive voltage to output its collector. This voltage is applied through D619 to error regulator input IC601/pin 1, making this IC believe that the 115V B+ is high.

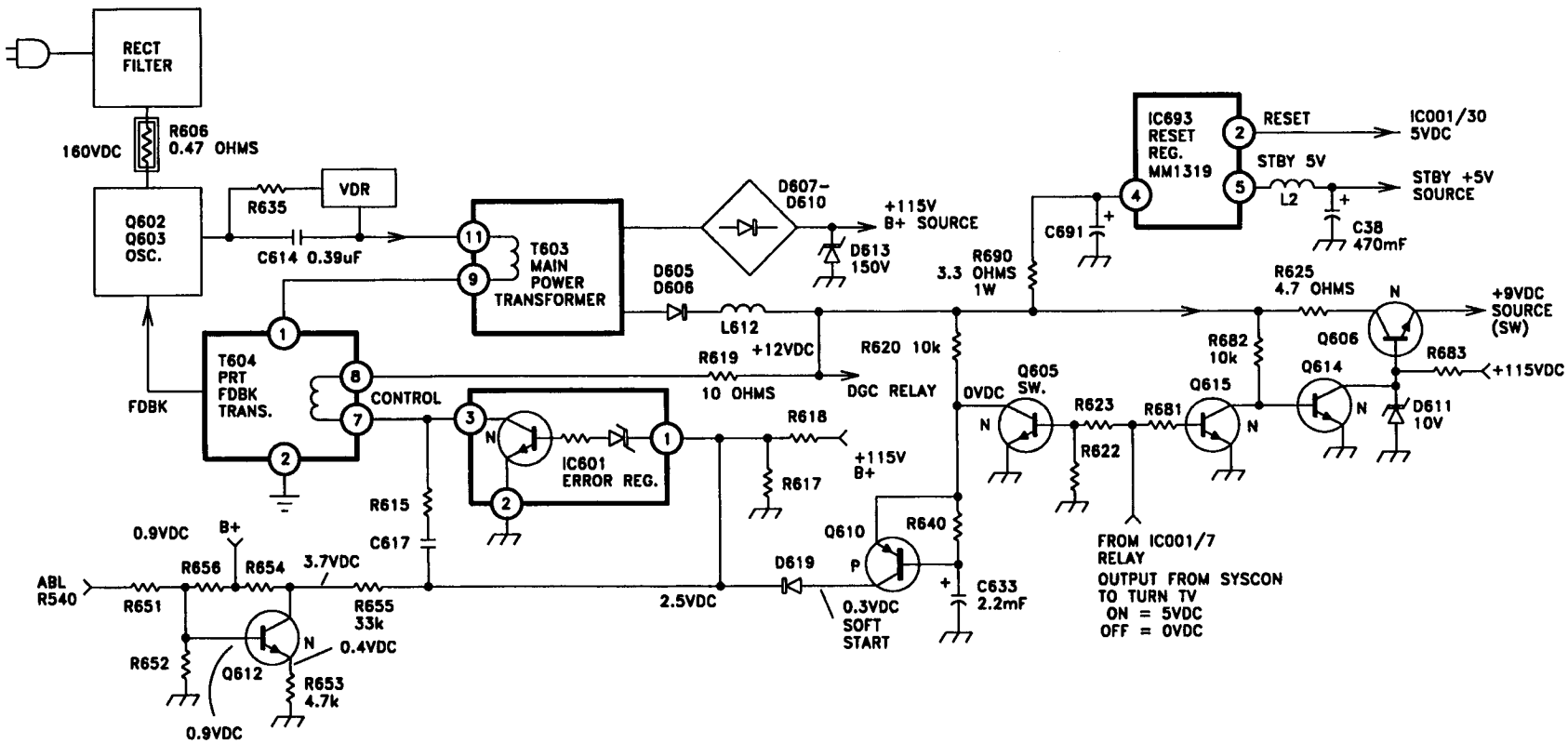
Regulator IC601 controls the 115V B+ line by varying the current through the control windings of feedback transformer T604 at pins 7 and 8. More current flowing through this control winding causes the oscillator frequency to increase. Since the oscillator frequency is normally above the resonate frequency of the main power transformer, an increase will cause T603 to output a lower voltage. Therefore at plug in, the 115VB+ supply is held LOW for a short period of time during start-up, thus preventing both shutdown and damage to the 150Vdc zener diode D613.

Power On

When the set is turned ON, either from the remote control or the front panel, the microprocessor (not shown) receives this command and outputs a HIGH at the "RELAY" terminal IC001/pin 7. This HIGH is applied to the base of Q615, causing it to turn ON. The 0V at Q615 collector is applied to the base of Q614, turning it OFF. This permits regulator transistor Q606 to operate with a positive bias coming into its base from R683. Zener diode D611 clamps this voltage to 10Vdc. The output voltage at Q606/emitter is therefore switched 9V, and applied to the Jungle IC301 (not shown) for H Osc./HV start.

Transistor Q605 is used to discharge Q610's base capacitor C633 at turn ON. Q605 is a reset transistor used to make sure Q610 operates every time at plug in, preventing excessive +115Vdc. If the TV was ON and it was repeatedly unplugged and plugged in, C633 may not have time to discharge /reset completely at power OFF. Q605 discharges C633 each time the set comes ON. This circuit is necessary, when the TV set is plugged into a cable box which is used to switch the TV ON and OFF.

Transistor Q612 amplifies a small amount of ABL voltage from the flyback and uses it to help in stabilizing the 115V B+ regulation. ABL voltage is applied to Class A amplifier Q612/base and output at its collector. This voltage is applied directly to the input of 115V regulator IC601/pin 1 to quickly correct for reduced B+ voltage at higher beam currents when the picture is bright. This prevents picture distortion (bending) by compensating for an instant excessive load (large bright white area in the picture) on the power supply's B+ line.



BA-3 CHASSIS POWER ON (KV20V60)

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HORIZ SHUTDOWN- BA-3 CHASSIS

Overview

The Jungle IC301 contains the horizontal oscillator of this Sony BA-3 direct view TV chassis. At turn ON, +9Vdc is applied to this Jungle IC301 and its horizontal oscillator starts. The horizontal drive signal is amplified and used to feed the flyback transformer and the horizontal deflection yoke, as in most televisions.

What is different about this circuit is the safety circuitry that surrounds it. There are two protection circuits. The first one is an over-current protection circuit that monitors the 115Vdc B+ current. If it becomes excessive, the Jungle chip is informed and horizontal drive pulses are removed.

The second protection circuit monitors the voltage output of the flyback. If this voltage becomes excessive, possibly through an open safety capacitor, then the Jungle IC301/pin 30 will receive a command and it will latch the horizontal drive pulses to ground, stopping the high voltage.

Horizontal Output

When the TV set is turned ON, 9V appears at pin 3 of Jungle IC301. This turns ON the crystal X300 at IC301/pin 33 and, shortly afterwards, the horizontal drive pulses are output at pin 29. These horizontal drive pulses are amplified by driver transistor Q550 and fed to driver transformer T551.

The secondary of T551 outputs to the horizontal driver transistor directly, which in turn feeds the flyback. The flyback in turn manufactures various voltages for the picture tube. They include the high voltage, heater voltages, 200V G2 voltage, and focus voltage. In addition to these voltages for the picture tube, the flyback also manufactures scan derived $\pm$15V supplies for the TV set.

Over Current Protection

The over current protection section is located in the top portion of the simplified diagram. The important parts of this circuit are Q504, R549 and D503. Resistor R549 is in series with the 115Vdc B+ supply that feeds the following loads:

1. horizontal output transistor via flyback and
2. driver transistor Q550 via T551.

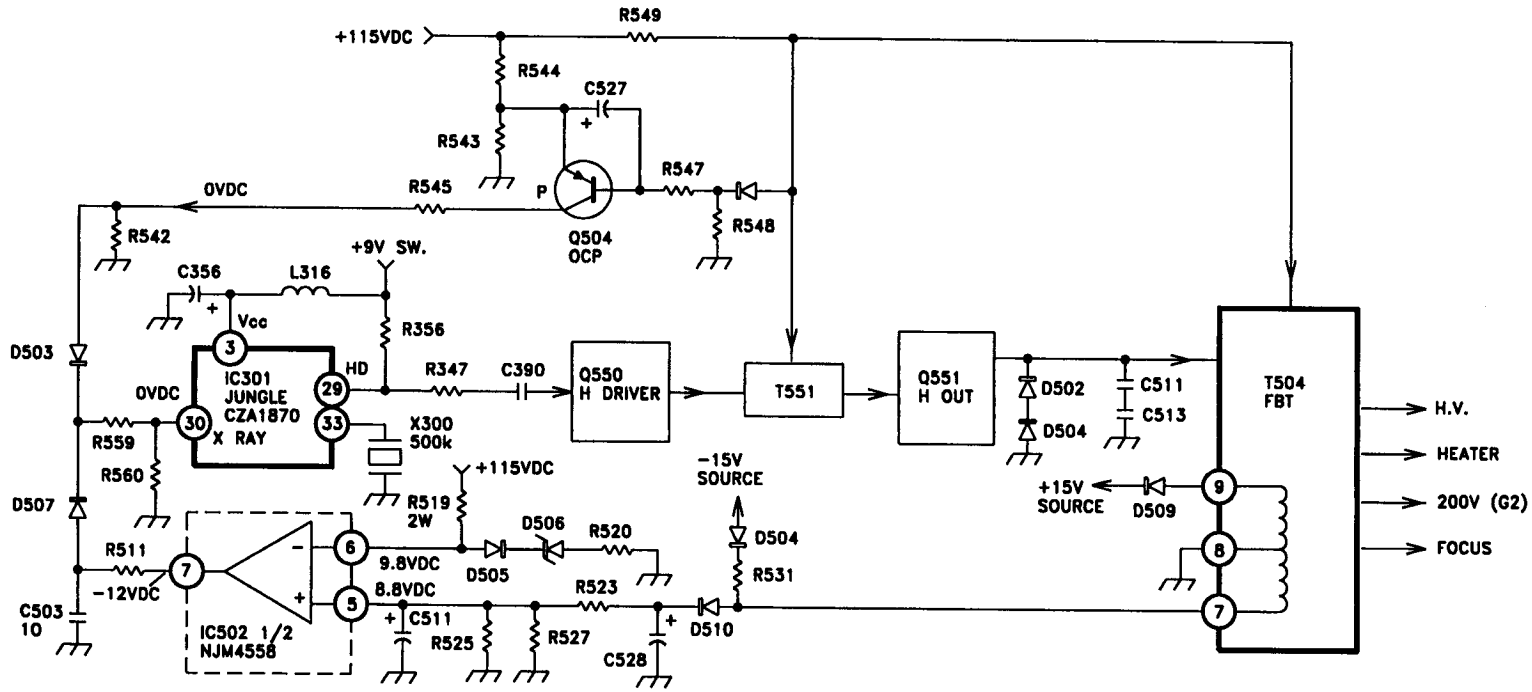
Q504's base to emitter terminals are arranged so they are across resistor R549. If either of the driver or output sections draw an abnormally high amount of current, the increased voltage drop across R549 turns ON Q504 and it outputs a HIGH from its collector. This HIGH is applied through R545 and blocking diode D503 into the Jungle IC301/pin 30. The HIGH at pin 30 activates an internal latch, which grounds out the horizontal drive signals (HD) at IC301/pin 29.

The loss of horizontal drive signals, stops the H. output stage from developing high voltage. The Jungle IC301 internal latch can be reset by turning the set OFF and turning it back ON, reapplying the 9V at IC301/pin 3.

High Voltage Protection

The high voltage protection stage is located at the bottom of the simplified diagram. It monitors the flyback pulses from T504/pin 7 and, if excessive, will apply a HIGH to Jungle IC301/pin 30 to shut down the horizontal drive/high voltage.

The circuit works this way: During normal operation, pulses from the flyback transformer T504/pin 7 are rectified by D510 and filtered by C528, so they output as a DC voltage proportional to the flyback amplitude. This DC voltage is filtered by C528 and reduced by the voltage divider circuit comprised of R523, R527 & R525 and additionally filtered by C511. The two filter capacitors, C511 and C528, are used to suppress normal transient voltages that may prematurely trip or shut down the set.



BA-3 CHASSIS HOR. SHUTDOWN (KV20V60)

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The result of this network is 8.8V at operational amplifier IC502/pin 5. IC502 is arranged as a comparator. The voltage input to this OP Amp at pin 5 is compared to the other input voltage at pin 6. The 9.8Vdc reference voltage at pin 6 is held constant by zener diode D506 and is temperature compensated by D505.

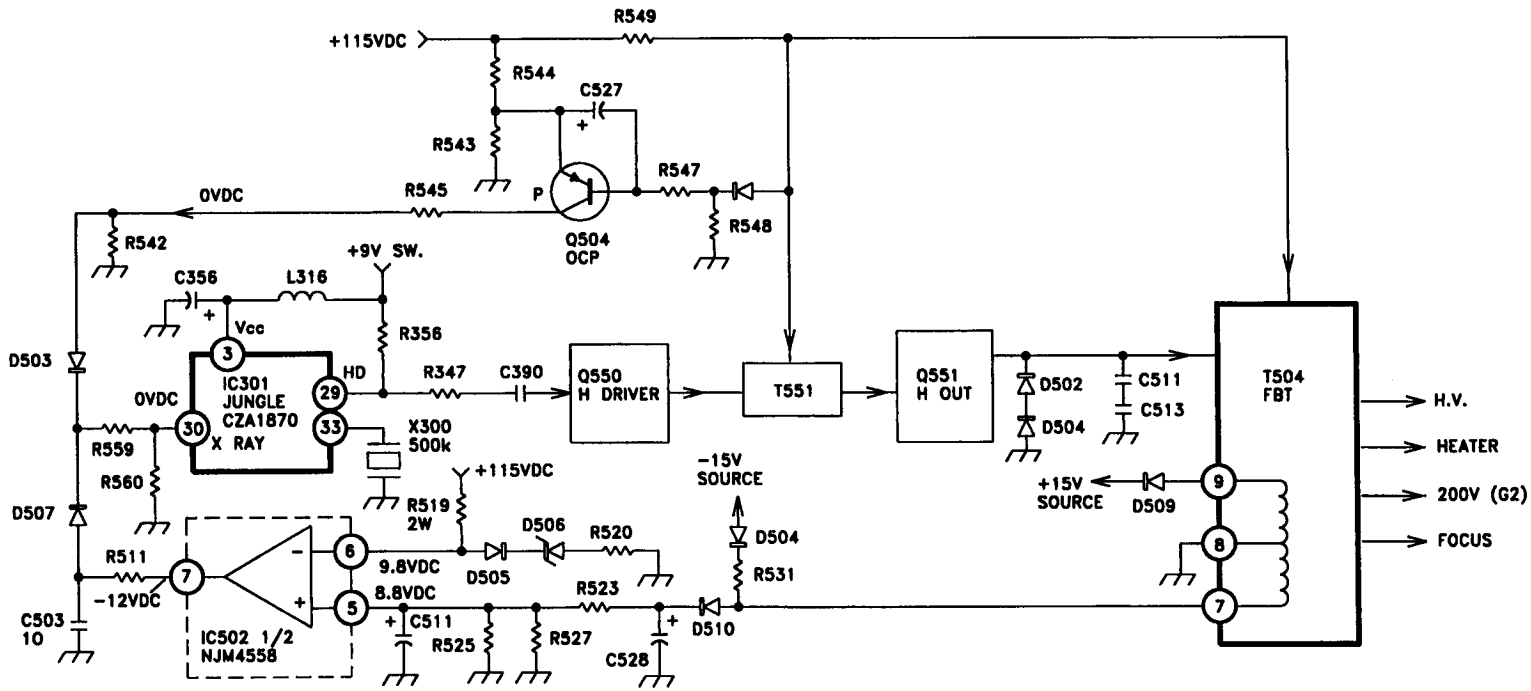
At comparator IC502, as long as the input voltage at IC502/pin 5 is lower than the reference voltage at pin 6, then the output at pin 7 will remain LOW at -12Vdc (normal operation). In the event the B+ voltage increases or the safety capacitor opens, causing the flyback voltages to increase, the input voltage at IC502/pin 5 will increase. When this voltage exceeds the 9.8 reference voltage at pin 6, the operational amplifier will output a positive voltage at pin 7.

The positive voltage passes through R511, gets filtered by C503, passes through blocking diode D507 and R559 and is applied to IC301/pin 30. This HIGH input shuts off the horizontal drive pulses output from IC301/pin 29 by latching this signal to ground.

Troubleshooting

A failure in this stage causes the high voltage to shut down immediately after the TV is turned on. Sound will be present because the +12Vdc that feeds the audio stages is active. To determine whether the over current protection circuit or the high voltage protection circuit has triggered this shutdown, a peak hold DVM can be used. Place the DVM at the unbanded end (anode) of D503 and turn on the TV set. The voltage should not normally rise above 1Vdc. If it does, excessive current demand from the flyback transformer or H. Output transistor could be the cause.

If D507 did not have a positive voltage on it, then move the voltmeter to the unbanded (anode) end of D507 and turn ON the set. The voltage here should remain at -12V. If it drops toward 0Vdc, it means the +115Vdc is higher than normal (+115V error regulator) or either safety capacitor C511 or C513 is open or changed value.



BA-3 CHASSIS HOR. SHUTDOWN (KV20V60)

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VERTICAL OUTPUT - BA-3 CHASSIS

Overview

After the TV set is powered ON, and HV is present, a picture appears on the screen only if three sections are functioning properly. These three sections are:

1. Vertical output stage operation & verification
2. Serial data communications
3. IK measurement circuitry completed

Vertical Oscillator Operation

At power ON, from within Jungle IC301, the vertical oscillator outputs at both pins 28, and pin 24. The signal from pin 28 is used for data communications as explained in "serial data communications" section. The signal output from pin 24 is used for vertical deflection. The vertical oscillator ramp waveform is applied to operational amplifier IC301/pin 3 for amplification. Its output signal at pin 1 is applied to the input of vertical output IC501/pin 4.

Within vertical output IC501, is a:

1. voltage boost section to increase its operating voltage only during retrace time and
2. current amplifier to drive the deflection yoke

The input signal is used to provide a boost voltage to assure linearity during the retrace interval. The retrace is the larger (amplitude) but narrower part (duration) of the vertical signal. The boost voltage is developed with the aid of isolation diode D502 and pump-up capacitor C509 across IC501/pins 3 and 7. D502 brings the +13Vdc into IC501/pin 3. From within IC501, some of the vertical signal is amplified and output pin 7 through C509 into pin 3 increasing its voltage, especially during the retrace interval where it is needed. This additional (boosted) voltage is used to make sure the retrace part of the main vertical waveform output IC501/pin 2 is amplified linearly.

The vertical output signal from Output IC501/pin 2 is then fed to the yoke for deflection. The yoke's ground return is through 1 ohm resistor R505. The signal at the junction of the yoke and 1 ohm resistor is fed back through R512 for linearity correction.

Serial Data Communications

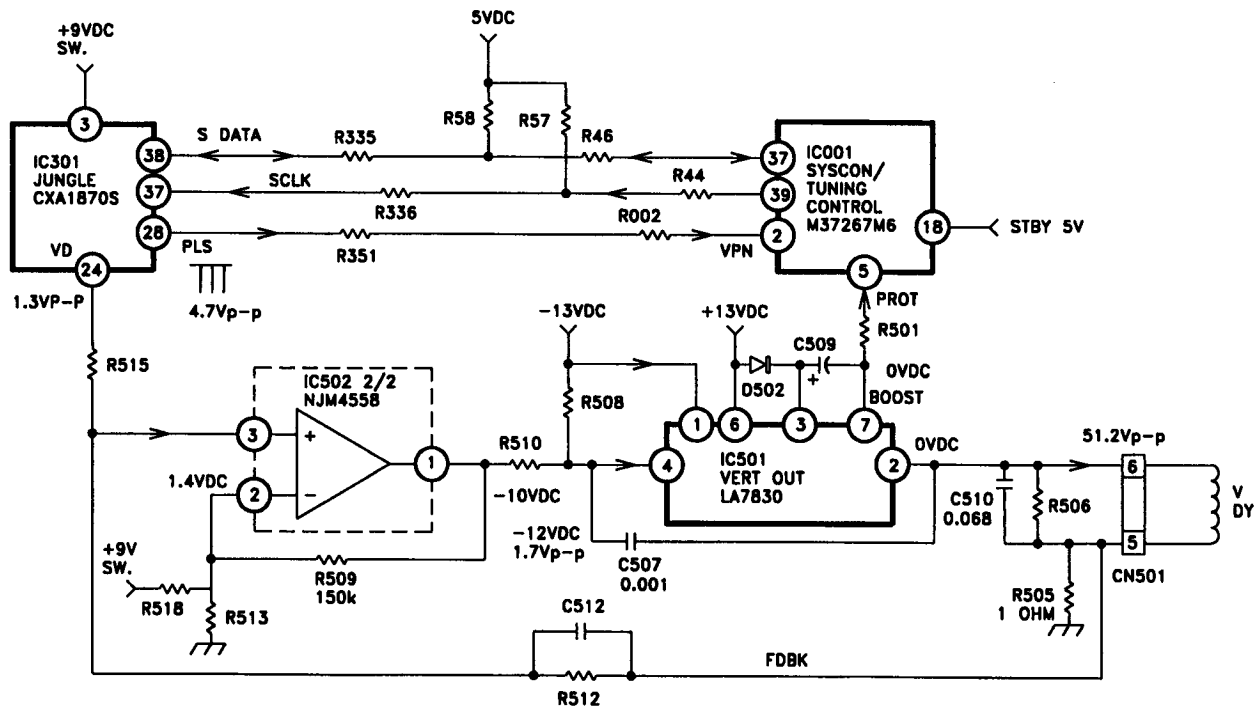
When the set is turned ON, 9V at Jungle IC301/pin 3 turns ON the vertical oscillator. Its output at pin 24 is used for vertical deflection. IC301/pin 28 outputs to system control IC001/pin 2 a vertical signal used for timing of the serial data.

With this vertical timing signal, Syscon IC001 can output serial data and clock signal as packets of information during the vertical blanking interval from IC001/pins 37 and 39. Serial data and clock is one of the inputs required to unblank the picture from the Jungle IC301.

Protection - Blanking

If the vertical section fails, the picture must be blanked in order to avoid a CRT phosphor burn. The circuitry that monitors for vertical output activity is within system controls IC001.

When the vertical output IC501 is outputting vertical signal, there is boost voltage that outputs pin 7. This voltage is applied through R501 to system controls IC001/pin 5 as 0V when the set is working properly. During a vertical failure, IC501/pin 3's voltage becomes positive. System controls IC001 sends serial data from pin 37 to Jungle IC301/pin 28, telling it to stop all RGB output (blank the TV screen).



BA-3 CHASSIS - VERT OUTPUT (KV20V60)

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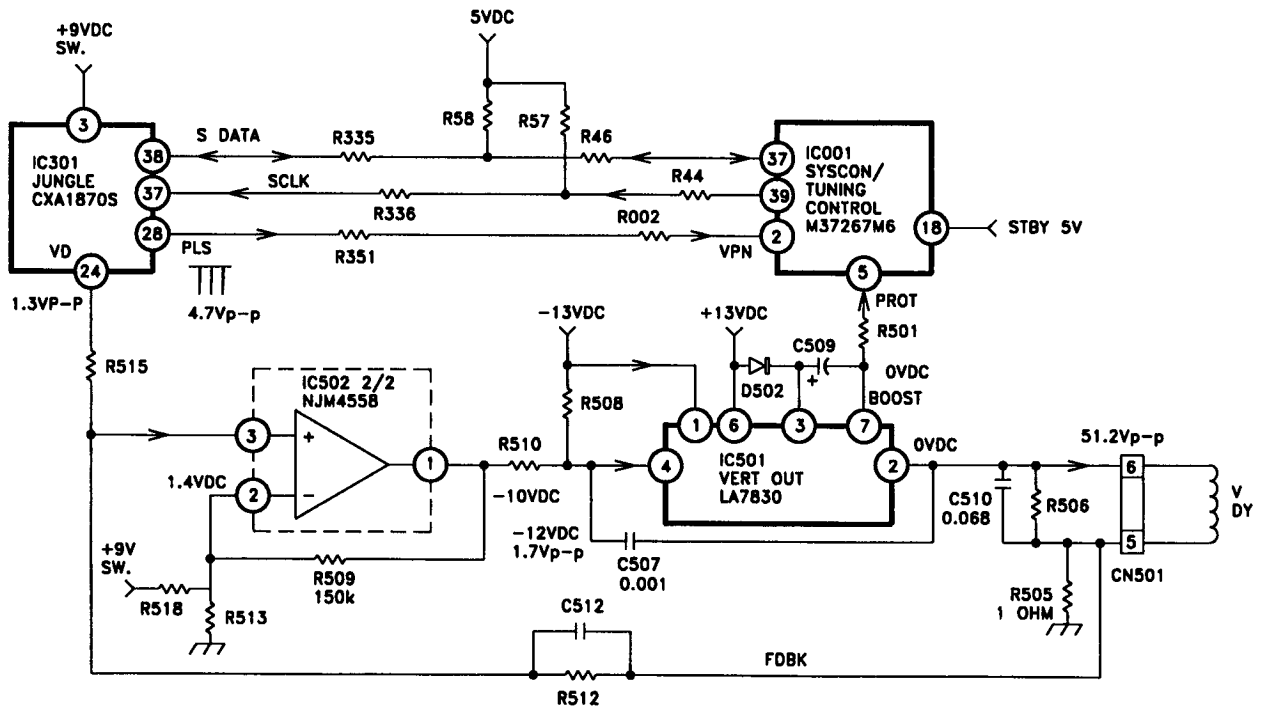
Troubleshooting

A loss of vertical sweep or serial data will cause blanking. We can identify where the problem is by first turning up the screen control and observing the picture. A faint single vertical line indicates a failure in the vertical stage, whereas brightness on the screen indicates a:

1. loss of the 60Hz packets of serial data or a
2. failure in the IK white balance circuitry.

The serial data can be checked with a scope at the Jungle IC301/pin 38. The clock signal should also be checked at pin 37. Both these signals must measure a minimum level of 4.8Vp-p, appearing regularly as packets of information at a 60Hz rate. No data will cause blanking but so can sporadic data packets. This can be caused by a missing vertical timing signal (IC301/pin 28).

The IK circuitry is the same as in the AA-2 chassis. The circuit description and troubleshooting is in this book under blanking 3 - white balance. A failure in the vertical stage can be identified with a scope. Follow the vertical signal from Jungle IC301/pin 24 through operational amplifier IC502/pin 1 to the output of IC501/pin 2. Once you have identified the section that is not outputting signal, DC voltages will identify the defective component.



BA-3 CHASSIS - VERT OUTPUT (KV20V60)

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